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SPECIAL Announcements

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These items are listed in Engineering Materials List, TID 4100, which is available on request from USAEC, Division of Technical Information Extension, P. O. Box 62, Oak Ridge, Tennessee 37831. New drawings are announced regularly in both U. S. Government Research Reports (USGRR) and Nuclear Science Abstracts (NSA). The announcement of the drawings in USGRR will begin with the issue of January 5, 1965. USGRR is published twice a month by OTS, and is sold by Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20204, at $15. a year, $3.75 additional for foreign mailing. NSA, published twice a month by AEC, is also available from Superintendent of Documents at $30. a year, $7. additional for foreign mailing.

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AEC REPORTS PRICE LIST DISCONTINUED

The semi-annual AEC Research Reports Price List has been discontinued. The last issue was No. 41, dated February, 1964. This special service has been discontinued in the interest of economy, especially in view of the fact that information relating to availability of AEC documents is reported adequately through Nuclear Science Abstracts and its indexes, and through the reference services of OTS provided to the public.

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

OFFICE OF TECHNICAL SERVICES
Donald A. Schon, *Director*

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, June 30, 1961.

U.S. Government Research Reports

This publication is issued twice a month to announce new reports of research and development released by the Department of Defense and certain other agencies of the Federal Government sponsoring research and development programs. Unless otherwise indicated, reports listed are available from the Office of Technical Services. The documents are available in original, reproduced, or microfiche copy only.

The first section of U. S. Government Research Reports (USGRR) is prepared for the Defense Documentation Center and is called "Technical Abstract Bulletin" (TAB). (DDC is a Department of Defense agency which services DOD agencies and their contractors with military research information.) The next section is called "Non-Military and Older Military Research Reports." Here are listed new reports of civilian agencies of the Government and military research reports not to be found in the "TAB." Most of these older military reports have been acquired by OTS in response to specific industry requests.

Atomic Energy Commission reports available from OTS are listed in Nuclear Science Abstracts. NSA is available to the general public on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at $30 a year (domestic), $37 a year (foreign). Single copy cost, $1.75 (plus 25 percent for foreign mailing).

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USGRR will announce in abstract form current Government-owned patents released for use by the public on a non-exclusive and royalty-free basis. Many companies already are manufacturing products or using processes based on previously announced patents.

The abstracts will appear in the January 5, 1965 issue of USGRR in the section headed Non-Military and Older Military Research Reports. It will present an idea of the essentials of an invention. If the reader is interested in one of the inventions after studying the abstracts, a copy of the specifications can be obtained for 25 cents from the Commissioner of Patents. A license for free use of the patent can be applied for to the Government agency administering the patent. The PATENT ABSTRACT SERIES publications formerly published by OTS have been discontinued.

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The OTS Technical Reports Newsletter is being discontinued effective with the December issue. The Superintendent of Documents, U. S. Government Printing Office will make the necessary adjustments to subscriptions due to expire after that date. It is suggested that Newsletter subscribers write to OTS to obtain an application form for a new "Fast Announcement Service" through which selected documents are brought to the attention of industry. These special announcements cover the type of material previously published in the Newsletter. There is no charge for this service.

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Dallas, Tex. 75222

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Boulder, Colo. 80301

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Seattle, Wash. 98105

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The following Cumulative Indexes for U. S. Government Research Reports are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., 20402:

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	Semi-annual Cumulative Index January - June 1962 Includes both Technical Abstract Bulletin (TAB) and "Non-Military and Older Military Reports" sections.	$3.50
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Volume 35	January - June 1961	$1.00
Volume 34	July - December 1960	$1.00
Volume 33	January - June 1960	$1.00
Volume 32	July - December 1959	$1.00

For information regarding the availability of earlier indexes write to Office of Technical Services, U. S. Department of Commerce, Washington, D. C. 20230

TECHNICAL ABSTRACT BULLETIN

1. Aircraft and Flight Equipment

AD-607 441 Div. 1
OTS Prices: HC $6.00/MF $1.25

Honeywell, Inc.,St.Paul, Minn.
TRAINABLE FLIGHT CONTROL SYSTEM INVESTIGATION.
Final rept. for 1 May 63-30 Apr 64,
by Fred B.Smith, Jr., John F. L.Lee, Arthur R. Butz, and Gregory J. Prom. Aug 64, 212p
ContractAF33 657 11316, Proj. 8225, Task 822501
FDL TDR64 89

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Adaptive control systems, Flight control systems), (*Flight control systems, Adaptive control systems), (*Artificial intelligence, Flight control systems), Servomechanisms, Control systems, Synthesis, Computer logic, Pattern recognition, Digital systems, Training, Numerical methods and procedures, Graphics.

The investigations reported herein are concerned with synthesis of adaptive control systems. It is assumed the plant motion over short time periods can be reasonably represented by constant coefficient ordinary differential equations of known form. The adaptive control systems considered are mainly characterized by: capabilities for adapting to general changes in plant dynamics; i.e., arbitrary changes in plant coefficients, and modest requirements on the arithmetical capabilities of the control computer. The report shows these objectives can be obtained by performing extensive computations during the control design phase and storing the solutions in a special manner. (Author)

AD-607 598 Div. 1
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
CONSTRUCTION OF AIRCRAFT: DEALING WITH THE EVOLUTION AND USES OF SOVIET AIRPLANES,
by M. N. Shul'zhenko. 19 Jun 57, 24p T-72
TT 64 71622

Unclassified report

Trans. of mono. Konstrukstii Samoletov, Moscow, 1953, p. 12-24.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Aircraft, Construction), (*Airplanes, USSR), Bombers, Design, Aerodynamic configurations, Aeronautics, History, Flight speeds.

AD-607 625 Div. 1
OTS Prices: HC $3.00/MF $0.75

General Dynamics/Convair, San Diego, Calif.
FATIGUE RESISTANT STRUCTURES,
by C. R. Smith. 31 Mar 59, 62p ZR-658-030

Unclassified report

Descriptors: (*Structures, Fatigue (Mechanics)), (*Fatigue (Mechanics), Structures), (*Metal joints, Fatigue (Mechanics)), Rivets, Riveted joints, Airframes, Stresses, Life expectancy, Strain (Mechanics), Deformation, Loading (Mechanics), Model tests, Aluminum alloys, Steel, Stainless steel, Titanium alloys, Reinforcing materials.

The work for the fiscal year of 1958 on Basic Fatigue Research has been directed towards obtaining methods for designing fatigue resistant structures. Two such methods have been obtained: (1) the use of rivets driven through the edge of splice doublers, and (2) the use of thin auxiliary doublers to permit using extra rivets away from the high stress area in the main splice doubler. Test data show that a substantially lighter structure could be had for the same fatigue life by using either of the two methods, or a lifetime of up to twenty times that of an equivalent weight structure of conventional design. Thin doublers are being used in the Models 880 and 600. Edge driven rivets have been approved for operators of commercial airlines in repairs or as fatigue inhibitors of airplanes now in service. Convair has a patent pending on edge driven rivets. Miscellaneous data are also presented on fatigue behavior and on photoelastic analysis of stress distribution in simulated and built up structures. (Author)

AD-607 656 Div. 1, 9
OTS Prices: HC $7.00/MF $1.75

Sikorsky Aircraft, Stratford, Conn.
PARAMETRIC INVESTIGATION OF THE AERODYNAMIC AND AEROELASTIC CHARACTERISTICS OF ARTICULATED AND RIGID (HINGELESS) HELICOPTER ROTOR SYSTEMS,
by E. R. Wood and A. C. Buffalano. Apr 64, 390p
SER-50359
Contract DA44 177TC831, Task 1D121401A14211
TRECOM TR64 15

Unclassified report

Descriptors: (*Helicopter rotors, Aeroelasticity), (*Rotor blades (Rotary wings), Design), Aerodynamic characteristics, Helicopters, Flight testing, Performance (Engineering), Mathematical analysis, Stresses, Vibration, Graphics, Tables.

This report presents results of an aeroelastic investigation to explore effects of parametric variations on blade stresses and performance of rigid (hingeless) and articulated helicopter rotor systems. The analysis considers the high-speed, steady-state flight condition and takes into account the fully coupled flatwise-edgewise-torsional response of the rotor blades. Calculated performance and one-half peak-to-peak flatwise stresses are shown to give good agreement with flight-measured values at higher airspeeds. It is found that blade twist is a significant variable for control of blade vibratory stresses and rotor performance. The sensitivity of rigid rotor flatwise and edgewise stresses to change in design of the blade root region is explored. Studies on variation of blade stiffness indicate that outboard blade stiffening is detrimental for an articulated blade, whereas inboard stiffening is detrimental for a rigid blade. For compound helicopters, selection of rotor rpm is found to require an important compromise between blade stress and power.

Technical rept.,
by Burton G. Tregub, Merlin P. Coffee, and C. E. Russell. Aug 63, 120p
Contract N61339 1205
NAVTRADEVCEN 1205 3

Unclassified report

See also AD-601 022, AD-602 427.

Descriptors: (*Helicopters, Simulation), (*Vertical take-off planes, Simulation), (*Equations, Motion), Programming (Computers), Mathematical models, Digital computers, Tilt wings, Short take-off planes, Airplane landings, Weapon systems, Training devices, Naval training, Aerodynamic characteristics, Flight simulators.

This report was written with the purpose of demonstrating the methods of mechanizing the equations of motion of helicopters and V/STOL aircraft by digital computing equipment. The report is based on the mechanization of the final equations developed in Volumes I and II of this report and assumes a knowledge of them. A general treatment of mathematical methods of analysis and of digital computer techniques is presented. The mathematical models developed in Volumes I and II for helicopters, both single and tandem rotor, and for V/STOL aircraft are presented in a digitally applicable form. Recommendations are given for computer memory size and for computer sophistication based on the findings of the study reported. (Author)

AD-607 764 Div. 1, 30
OTS Prices: HC $5.00/MF $1.00

Melpar, Inc., Falls Church, Va.
FEASIBILITY STUDIES ON USE OF ARTRONS AS LOGIC ELEMENTS IN FLIGHT CONTROL SYSTEMS.
Final rept.,
by R. E. Mirabelli, E. M. Connelly, and J. E. Worthen.
Sep 64, 155p
Contract AF33 657 11026, Proj. 8225, Task 822502
FDL TDR64 23

Unclassified report

Descriptors: (*Feasibility studies, Flight control systems), (*Flight control systems, Integrated circuits), Computer logic, Adaptive control systems, Models (Simulations), Control systems, Training, Networks, Simulation, Mathematical models, Statistical processes, Theory, Operation, Design.

Results of the theoretical studies of the use of redundant self-organizing elements as a means of providing a reliable self-organizing controller are presented. A mathematical representation of the trainable logical network as a finite state device and an analysis of the organization process as a Markov process is given. Goal functions for control systems are developed from Lyapunov functions. A digital computer study of the self-organizing logical controller and study results are presented. The theory, method of operation, and design techniques of the RELIATRON (Reliable ARTRON) are given. (Author)

AD-607 768 Div. 1, 18
OTS Prices: HC $6.00/MF $1.25

Republic Aviation Corp., Farmingdale, N. Y.
ZA-3 AIR CUSHION VEHICLE TEST PROGRAM.
Final rept.
20 Oct 64, 212p RAC-2612
Contract Nonr4500 00

Unclassified report

Descriptors: (*Ground effect machines, Amphibious operations), (*Amphibious operations, Ground effect machines), Environmental tests, Military requirements, Tests, Performance (Engineering), Ocean waves, Terrain, Propulsion, Drag, Stability, Maneuverability, Model tests, Fluid dynamic properties.

Successful continuous operations in heavy seas and surf were achieved. Landings and departures were performed through surf with breaking waves as high as 7 to 8 feet, and a capability for higher breakers is indicated. Vehicle stability and ride characteristics are considered superior to those of hydrofoils and planing hull craft; no seasickness or discomfort was reported by passengers or crew. The maximum normal bow accelerations, recorded in the aforementioned 8- to 12-foot waves, were 1.5g. In sea state 3, approximately 80 percent of all normal bow accelerations fell below 0.6g. Amidships, all accelerations were significantly lower. The moderate acceleration levels can be attributed to the damping effect of the air cushion. Although the flexible skirt design was adequate for this program, it cannot be considered sufficiently developed for operational usage. Maintenance and repair hours were far in excess of acceptable values. A high degree of mission reliability with major skirt damage, however, was demonstrated on more than one occasion. Small arms fire damage, therefore, may be considered insignificant.

AD-607 771 Div. 1, 11, 14
OTS Prices: HC $3.00/MF $0.75

Bell Aerosystems Co., Buffalo, N. Y.
STUDY OF FLEXIBLE JET EXTENSIONS FOR AIR CUSHION VEHICLES, PHASE III.
Oct 64, 83p Bell-2131-920003
Contract Nonr4491 00

Unclassified report

Descriptors: (*Ground effect machines, Ducts), (*Ducts, Inflatable structures), (*Organic coatings, Inflatable structures), (*Nylon, Inflatable structures), Synthetic rubber, Polyvinyl chloride, Wear resistance, Specifications, Model tests, Textiles, Extendable structures, Air ejectors, Isocyanate plastics.

The performance of commercially available materials in flexible trunks for air cushion vehicles was evaluated. An advanced design concept was developed for a flexible trunk to provide loadings in testing similar to those experienced in operation with inflated bag-type trunks. A specification setting the limiting values for critical properties of flexible trunk material was written. Four new materials supplied by vendors in response to the specification were laboratory tested for tear strength, tensile strength, elongation, abrasion resistance, and other related properties. Performance of the new materials, which consisted of nylon coated with hypalon, neoprene, poly (vinyl chloride), and polyurethane, respectively, were compared with the performance of nylon coated with U. S. Rubber 105-4-108, which had been tested previously in full-scale operation. Model flexible trunks were fabricated from selected materials and tested on the Bell rotating arm facility to evaluate performance, wear characteristics, and comparable life expectancy.

AD-607 906 Div. 1, 28
OTS Prices: HC $7.00/MF $1.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AVIATION PSYCHOLOGY,
by K. K. Platonov. 14 Aug 64, 369p
FTD MT64 177; TT 64 71649

Unclassified report

AD-607 657 Div. 1, 9
OTS Prices: HC $3.00/MF $0.75

Mississippi State Univ., State College.
EFFECTS OF TRANSPIRATION THROUGH ANGLED SLOTS ON THE DEVELOPMENT OF THE TURBULENT BOUNDARY LAYER,
Aerophysics Research rept. no. 43,
by Gordon L. Harris. Sep 64, 64p
Contract DA44 177AMC892T, Task 1D121401A14203
TRECOM TR64 43
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
Descriptors: (*Boundary layer control systems, Aerodynamic slots), (*Boundary layer, Evaporation), Gliders, Turbulence, Injection, Equations, Theory.

An attempt was made to fundamentally understand the nature of slot transpiration and to establish an appropriate mathematical formulation of the problem suitable for its solution. These solutions will be compared with experimental data obtained at flight Reynolds numbers.

AD-607 658 Div. 1
OTS Prices: HC $3.00/MF $0.75

Aviation Safety Engineering and Research, Phoenix, Ariz.
PERSONNEL RESTRAINT SYSTEMS STUDY, CH-47 VERTOL CHINOOK,
Crash Injury Evaluation,
by Joseph L. Haley, Jr. and James P. Avery. Apr 64, 86p AvCIR-62-26
Contract DA44 177AMC888T, Task 1A024701A12101
TRECOM TR64 4
Unclassified report

Descriptors: (*Aviation safety, Safety harness), (*Safety harness, Helicopters), (*Helicopters, Safety harness), Transport planes, Army personnel, Military requirements, Installation, Cockpits, Fuselages, Seats, Locking fastener devices, Loading (Mechanics), Shear stresses, Costs, Weight, Equations.

Detailed recommendations for the improvement of the personnel restraint systems in the U. S. Army CH-47 aircraft are presented. The recommendations pertain primarily to the strengthening of existing components. The modifications proposed indicate the following strength improvements: (1) Cockpit-the crew's restraint system is increased from an 8-12G value to 25-30G value; (2) Troop Compartment - the troop's lap-belt attachments are increased from a 10-15G value to a 22-28G value. The above strength increases can be achieved with a weight increase of 7 pounds per aircraft and at a cost of approximately $300 per aircraft. The following information is included in the report: (1) Engineering - strength analysis of proposed modifications; (2) Administrative - a cost and weight summary of proposed modifications; (3) Detailed engineering drawings are available as a supplement to this report: (a) parts procurement or manufacture - drawings necessary for the procurement or manufacture of retrofit kits. (b) installation procedure - sufficient information is included in the drawings for installation of retrofit kits by army personnel. (Author)

AD-607 659 Div. 1
OTS Prices: HC $3.00/MF $0.75

Aviation Safety Engineering and Research Phoenix, Ariz.
CRASH INJURY EVALUATION; SUPPLEMENT TO PERSONNEL RESTRAINT SYSTEMS STUDY, CH-47 VERTOL CHINOOK,
92p AvCIR-62-26
Contract DA44 177AMC888T, Task 1A024701A12101
TRECOM TR64 4 suppl. Unclassified report

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See also: AD-607 658.

Descriptors: (*Aviation safety, Safety harness), (*Safety harness, Helicopters), (*Helicopters, Safety harness), (*Mechanical drawings, Safety harness), Military requirements, Transport planes, Cockpits, Fuselages, Seats, Shear stresses, Loading (Mechanics), Installation, Locking fastener devices, Reinforcing materials.

Contents: Installation of personnel restraint system; Inertia reel installation (pilot's and copilot's seat); Reinforcement of lap belt attachment; Reinforcement of cockpit floor and tract modification; Installation of tie-down strap (alternate 1); Installation of control cable and shoulder harness; Reinforcement of vertical track, seat bucket (crew seat); Modification of carriage assembly (crew seat); Reinforcement of lock-pin assembly (seat base); Shoulder harness (troop commander); Installation of attachment fitting for shoulder harness; Fitting for shoulder harness attachment (left-hand side); Fitting for shoulder harness attachment (right-hand side); End fitting for lap belt; Lap belt; Installation of restraint system; Lap belt attachments; Lap belt tie-down strap; and Pilot's tie-down strap.

AD-607 737 Div. 1, 9, 23
OTS Prices: HC $6.00/MF $1.25

Melpar, Inc., Falls Church, Va.
SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT. VOLUME III, PART I. COMPUTATIONAL METHODS ANALOG. STUDY, EQUATIONS OF MOTION OF VERTICAL/SHORT TAKE-OFF AND LANDING OPERATIONAL FLIGHT/WEAPON SYSTEM TRAINERS. Technical rept.,
by R. A. Castle, A. L. Gray, and Walter McIntyre.
May 64, 230p
Contract N61339 1205
NAVTRADEVCEN 1205 3
Unclassified report

Descriptors: (*Helicopters, Simulation), (*Vertical take-off planes, Simulation), (*Equations, Motion), Programming (Computers), Mathematical models, Analog computers, Tilt wings, Short take-off planes, Airplane landings, Weapon systems, Training devices, Naval training, Aerodynamic characteristics, Flight simulators.

This report demonstrates methods of mechanizing the equations of motion of helicopters and V/STOL aircraft by the use of analog computing equipment. The equations of motion of these aircraft are presented in NAVTRADEVCEN Technical Reports 1205-1, -2 (AD-601 022, AD-602 427), and this report assumes a knowledge of such equations by the reader. The report reviews and discusses criteria for the selection of analog computer type as 60 cycle and 400 cycle, and choice of carrier, as well as specific computer components. A helicopter and a tilt wing V/STOL are selected for computer mechanization and the presentation of computer flow diagrams which may be typical computer diagrams used in the analog simulation of such aircraft are discussed. (Author)

AD-607 738 Div. 1, 9, 23
OTS Prices: HC $4.00/MF $0.75

Melpar, Inc., Falls Church, Va.
SIMULATION OF HELICOPTER AND V/STOL AIRCRAFT. VOLUME III, PART II. COMPUTATIONAL METHODS DIGITAL. STUDY, EQUATIONS OF MOTION OF VERTICAL/SHORT TAKE-OFF AND LANDING OPERATIONAL FLIGHT/WEAPON SYSTEM TRAINERS.

2. Astronomy, Geophysics and Geography

AD-607 432 Div. 2
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
NEW DATA ON THE GEOMORPHOLOGY OF THE FLOOR OF THE NARES ABYSSAL PLAIN,
by A. V. Il'yin and G. V. Bogorov. Jan 64, 4p
NRC-C-4725
DSIS T388R; TT 64 25468

Unclassified report

Trans. of Akademiya Nauk SSSR. Doklady, 1963, v. 148, no. 6, p. 1392-1393.
Also available from NRC as C-4725.

Descriptors: (*Ocean bottom topography, Atlantic Ocean), (*Atlantic Ocean, Ocean bottom topography), Marine geology, Hydrographic surveying, Oceanographic equipment, USSR.

The Nares Abyssal Plain is bounded by the Bermuda Plateau, a zone of abyssal hills adjacent to the Mid-Atlantic Ridge, and the Outer Ridge. To the west it joins with the Vema Trough and the Hatteras Abyssal Plain. Its area, according to Heczen's calculations, is 37,000 square miles. In the middle of 1962 a Soviet expedition on the Petr Lebedev carried out an area survey crossed-run survey of one region in the southern part of the Nares Plain. Within this area of 2000 square miles 20 sounding runs were made, separated by distances of 8-10 miles and of total length about 500 miles. From the survey data, echo profiles and a bathymetric chart (Fig. 1) were compiled. Examination of the chart and other data shows that the surveyed region lies at depths greater than 5800 m, and is characterized by a generally flat relief. A very feeble north-to-south rise of the bottom is observed. Over a distance of 30 miles the depths vary by 25 m in the mean (from 5835 to 5810).

AD-607 433 Div. 2
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
SOME LAWS EXHIBITED BY GEOMAGNETIC BAYS IN THE MIDDLE LATITUDES,
by L. L. Van'yan and E. P. Kharin. Aug 64, 8p
NRC-C-5064
DSIS T404R; TT 64 25469

Unclassified report

Trans. of (Geologiya i Geofizika) (USSR) 1963, no. 9, p. 125-129.
Also available from NRC as C-5064

Descriptors: (*Terrestrial magnetism, Electric currents), Magnetic fields. , Sources, Geophysics, USSR.

The source of geomagnetic bays is electric currents flowing in a band about 400 km wide at a height of 100-150 km in the region of 70 degrees north latitude. Some features of the variable magnetic field which these currents produce in the middle latitudes are examined. For this purpose the current layer is replaced by an equivalent linear current, this being in practice permissible at distances exceeding 1500-2000 km from the current layer. To simplify the mathematics, two further assumptions are made. In view of the relatively small portions of the earth's surface involved, the curvature of this surface, and also the (corresponding) curvature of the linear current are neglected.

AD-607 434 Div. 2
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
CONCERNING MAGNETIC FIELD VARIATIONS IN THE CARRYING OUT OF PRECISE REGIONAL AEROMAGNETIC SURVEYS,
by I. M. Pudovkin. Jun 63, 4p
DSIS T393R; TT 64 25470

Unclassified report

Trans. of Akademiya Nauk SSSR. Izvestiya. Seriya Geofizicheskaya, 1956, no. 8, p. 997-998.
Also available from NRC.

Descriptors: (*Terrestrial magnetism, Measurement), Magnetic fields, Oscillation, Airborne, Surveying, Geophysics, USSR.

AD-607 453 Div. 2
OTS Prices: HC $1.00/MF $0.50

Texas Univ., Austin.
A SPECTROPHOTOMETRIC ANALYSIS OF PROCYON. Final rept.,
by Frank N. Edmonds, Jr. Oct 64, 5p
Grant Nonr G00063 62, Proj. NR046 797

Unclassified report

Descriptors: (*Stars, Spectroscopy), Atmosphere models, Chemical properties, Line spectrum, Thermodynamics.

A summary is given of spectrophotometric studies of the F54 subgiant Procyon. The investigation involves a 'fine analysis' of equivalant lines of spectral lines, utilizing a model atmosphere, with the primary aim of determining the abundance of as large a number of chemical elements as possible. Also reported is an investigation of the possible use of non-local thermodynamic equilibrium techniques in the analysis of the spectra of Procyon.

AD-607 478 Div. 2, 13
OTS Prices: HC $10.85/MF $3.25

RAND Corp., Santa Monica, Calif.
STATE OF STRESS IN THE EARTH'S CRUST. PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, JUNE 13 AND 14, 1963, SANTA MONICA, CALIFORNIA,
ed. by William R. Judd. Sep 64, 783p RAND-R-428

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. The initial distribution copies contain color which will be shown in black-and-white when it is necessary to reprint.

Descriptors: (*Lithosphere, Mechanical properties), (*Engineering geology, Symposia), (*Rock (Geology), Mechanics), Petrology, Structural geology, Geophysics, Seismology, Civil engineering, Underground structures, Vulnerability, Nuclear explosions.

Contents: Rock stress, rock mechanics, and research; megageological considerations in rock mechanics, plowshare: scientific problems, brittle fracture of rocks, viscoelasticity of rocks, strain energy in rocks, strength variation and deformational behavior in anisotropic rock, failure of homogeneous rock under dynamic compressive loading, rock mechanics research in south Africa, in situ determination of stress by relief techniques, theory and applicati of curved jacks for measurement of stresses, the in situ measurement of rock stress based on deforma-

Edited machine trans. of mono. Psizhologiya Letnogo Truda, Moscow, 1960, p. 1-351.

Descriptors: (*Aeronautics, Psychology), (*Psychology, Aeronautics), Flight, Pilots, Sensory perception, Attention, Reading, Memory, Personality, Emotions, Fatigue (Physiology), Aviation safety, Aviation accidents, Psychomotor tests, Psychometrics, Training.

The report is concerned with the objects, methods, and history of aviation psychology; characteristics of mental processes in the pilot's work: problems of attention, thought, memory, emotions, and the psychomotor system; psychological analysis of flying: psychological characteristics of practice of flight, flying by instruments, and high-altitude, speed, and space flights; special problems of aviation psychology: psychological rationalization of flight training, the regime of flying and rest, aviation engineering; psychological research in the practice of medical-aviation expertise. General theoretical information and descriptions of the method of studying the flying abilities of students and pilots and their erroneous actions are cited, and methods of analyzing the causes of flight accidents are considered from psychological positions. By means of concrete examples it is shown that it is important to consider the laws of psychology in the different activities of flying.

AD-607 920 Div. 1
OTS Prices: HC $1.00/MF $0.50

Federal Aviation Agency, Palmdale, Calif.
FEDERAL AVIATION AGENCY ADVISORY.
Final rept.
by H. M. Vick and A. D. Carter. 26 Oct 63, 14p
ARPA VUF1017

Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Aviation safety, Nuclear explosions), (*Nuclear explosions, Aviation safety), Air traffic control systems, Flight paths, Hazards, Radiological contamination, Test facilities, Underground explosions, Nevada.

Objective was to delineate a sector through which, had the nuclear explosion vented, a contaminated air mass would have been expected to move and through which non-participating military or civilian aircraft would be advised not to fly. Had venting occurred, such predesignation of a potentially hazardous air space would have avoided startling pilots flying near the test site, prevented unintentional penetration of a contaminated air mass, and minimized traffic hazards to participating aircraft. The FAA has concluded that the Project Shoal Air Space Advisory Plan provided all proper precautions necessary to ensure against radioactive contamination of airmen or aircraft.

AD-607 502 Div. 2
OTS Prices: HC $4.00/MF $0.75

Aerospace Technology Div., Library of Congress, Washington, D. C.
SOVIET METEOROLOGY AND CLIMATOLOGY: COMPILATION OF ABSTRACTS,
Rept. no. 2.
5 Oct 64, 103p
ATD P64 55; TT 64 71604

Unclassified report

Rept. on Surveys of Soviet-Bloc Scientific and Technical Literature.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Meteorology, Abstracts), (*Climatology, Abstracts), Bibliographies, Reviews, USSR.

The report is based on Soviet open literature, published in 1962 and 1963. Topics include: Climatology of high levels, general circulation of the atmosphere, weather forecasting, and regional studies and local phenomena.

AD-607 504 Div. 2, 12
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
EXTREME MODEL ATMOSPHERE OF MARS,
by Gerhard F. Schilling. Jun 62, 8p P-2600

Unclassified report

Prepared for presentation at the 11th International Astrophysical Symposium, Liege, Belgium, 9-11 Jul 62.
Supported in part by the Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena, Contract N33561 (NAS7 100).

Descriptors: (*Mars, Atmosphere models), (*Planetary atmospheres, Mars), Pressure, Temperature, Density, Mathematical analysis, Mars probes, Space probes, Design.

Theoretical models of the atmosphere of Mars were computed on the basis of present factual knowledge with a minimum of assumptions. The resultant model atmosphere gives extreme upper and lower limits for pressure, temperature, and density in the Martian atmosphere up to 150 km altitude. While this rigorous method yielded reliable data needed for the engineering design of space probes, the spread of values is still extremely wide and indicative of the present scarcity of knowledge. (Author)

AD-607 537 Div. 2
OTS Prices: HC $3.00/MF $0.75

Electrical Engineering Research Lab., Univ. of Texas, Austin.
THEORETICAL AND EXPERIMENTAL EVALUATION OF AN ENCLOSURE FOR THE INVESTIGATION OF ATMOSPHERIC LONGWAVE RADIATION PHENOMENA.
Final rept.,
by Glen E. Willis and Claude E. Duchon. 30 Jun 64, 72p EERL-4-11
Contract AF19 628 2475, Proj. 7655, Task 765503
AFCRL 64 692

Unclassified report

Descriptors: (*Infrared radiation, Test facilities), (*Atmosphere, Infrared radiation), Models (Simulations), Construction, Polyethylene plastics, Films, Aluminum, Reflection, Blackbody radiation, Mathematical models, Thermodynamics.

An enclosure was constructed of a polyethylene film top and four polished aluminum walls resting on a platform on the ground. Measurements of longwave radiation and air temperature were made at various locations inside the enclosure as a function of time under clear nighttime skies. A mathematical model was formulated in which the upward and downward components of radiation were computed from radiative transfer theory as a function of height at the center of the enclosure. The computations show that with a wall reflectivity of 0.95, a polyethylene film reflectivity of 0.15, and the lower boundary radiating as a black body, the divergence of net radiation due only to the walls is the same order of magnitude as the divergence measured in the atmosphere. Values of divergence were measured inside the real enclosure of the same order of magnitude as predicted by the theory. Consequently, the concept of a horizontally homogeneous radiating atmosphere, attained if the walls acted as specular reflectors with a reflectivity of unity, could not be realized. (Author)

AD-607 538 Div. 2, 30
OTS Prices: HC $7.55/MF $2.00

Ionosphere Research Lab., Pennsylvania State Univ., University Park.
A SUMMARIZATION OF TECHNICAL AND SCIENTIFIC REPORTS ISSUED BY THE IONOSPHERE RESEARCH LABORATORY-PAPERS PRESENTED AND PUBLISHED.
Scientific rept.,
by A. H. Waynick. 1 Dec 63, 456p IRL-200
Contract AF19 628 4014, Proj. 8605, Task 860502
AFCRL 64 815

Unclassified report

Descriptors: (*Ionosphere, Bibliographies), Atmosphere, Scientific research, Reports, Abstracting, Ionospheric propagation, Radio waves, Absorption, Electron density, Plasma physics, Meteorological parameters, Meteorological instruments, Electronic equipment, Solar radiation, Scientific satellites, Upper atmosphere, Chemical properties.

The report is divided into three major sections. The first of these contains the title, author(s) and date of issuance of each Laboratory scientific or technical report. Where appropriate, the abstract and conclusions of the report are included. The second section is a listing by title, author and other relevant information concerning papers presented at technical and scientific meetings. The third section comprises reference material on paper publication. (Author)

AD-607 559 Div. 2, 8
OTS Prices: HC $2.00/MF $0.50

Electrical Engineering Research Lab., Univ. of Texas, Austin.
AN INVESTIGATION OF TAU A AND SGR A MILLIMETER WAVELENGTH RADIATION.
Scientific rept. no. 2,
by C. W. Tolbert and A. W. Straiton. 28 Aug 64, 26p EERL-6-61
Contract AF19 628 1679, Proj. 5629, Task 562902
AFCRL 64 720

Unclassified report

Descriptors: (*Extraterrestrial radio waves, Millimeter waves), (*Radioastronomy, Millimeter waves), (*Galaxies, Extraterrestrial radio waves), Antennas, Radiometers, Intensity, Temperature, Measurement.

The technique of investigating the position and flux density of 35 Gc and 70 Gc Tau A radiation and 35 Gc and 94 Gc Sgr A radiation are described. Tau A (35 Gc)

tion measurements, geophysical measurements of rock properties in situ, petrofabric techniques for the determination of principal stress directions in rocks, application of rock mechanics in the design of rock slopes, the problem of open-pit mine stability, rock mechanics considerations in the design of concrete dams, rock mechanics considerations in the design of underground protective structures, nuclear surface bursts and the design of protective construction in hard rock, some cases of residual stress effects in engineering work.

AD-607 487 Div. 2, 5
OTS Prices: HC $2.00/MF $0.50

Naval Research Lab., Washington, D. C.
EXPERIMENTAL OBSERVATIONS OF FORWARD SCATTERING OF LIGHT IN THE LOWER ATMOSPHERE.
Interim rept.,
by J. A. Curcio and L. F. Drummeter, Jr. 30 Sep 64, 50p
Proj. RR004 02 42 5152
NRL 6152

Unclassified report

Descriptors: (*Light transmission, Scattering), (*Atmosphere, Light transmission), (*Light, Propagation), Aerosols, Communication systems, Lasers, Air pollution, Ruby.

The report deals in part with the experimental results from seven measurements on the forward scattering of light by the atmospheric aerosol. In addition, considerations of the problem of detecting forward scattered light in the daytime show that estimated results agree with the available experimental data. Considerations of the feasibility of using over-the-horizon propagation as a communications link leads to the estimation that communication between fixed points at Morse code rates is currently feasible over ranges of the order of 50 km in the daytime for meteorological ranges of 16 km or more, using a narrow-beam projector as source. Ship-to-ship communication would require sources of very high power or precise stabilization and pointing of existing high-intensity searchlight sources. (Author)

AD-607 491 Div. 2, 6
OTS Prices: HC $4.00/MF $0.75

Pennsylvania State Univ., University Park. Mineral Industries Experiment Station.
STUDIES OF THE EFFECT OF DEPTH OF FOCUS ON SEISMIC PULSES: ESTIMATION PROCEDURE FOR FOCAL-DEPTH DETERMINATION OF SEISMIC DISTURBANCES.
Special technical rept.,
by Stephen C. Merdler. 8 Sep 64, 114p
Contract AF19 628 238, Proj. 8652, ARPA Order 292
Tasks 865208
AFCRL 64 755

Unclassified report

Rept. on Proj. VELA-UNIFORM.

Descriptors: (*Earthquakes, Position finding), (*Seismic waves, Propagation), Mechanical waves, Microseisms, Nuclear explosions, Identification systems, Signal-to-noise ratio, Seismology, Detection.

A new data processing technique is suggested to estimate the delay time between initially uptraveling energy which is reflected once at the earth's surface and initially downtraveling energy on earthquake seismograms. The method uses optimum inverse filters together with a criterion that measures the simplicity of a seismic signal convolved with an inverse filter. The technique was applied to band-limited synthetic signals that contained several primary-secondary pairs in the presence of random noise. Of 27 synthetic signals which were analyzed, the procedure successfully selected the correct delay time in 22 cases. Four actual earthquake seismograms were then analyzed. The procedure selected a delay time for each earthquake. Focal depths computed from the selected delay times appeared quite reasonable when compared with depths for the same earthquakes published by the United States Coast and Geodetic Survey. In all cases, the inverse filter designed for the selected delay time considerably simplified the original seismogram. It is concluded that the technique provides a reasonable estimate of the delay time between primary and surface reflected energy. (Author)

AD-607 495 Div. 2, 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ACTIVE REACTION TO METEOROLOGICAL PROCESSES,
by E. K. Fedorov. 13 Oct 64, 17p
FTD TT64 667; TT 64 71599

Unclassified report

Unedited rough draft rans. of Akademiya Nauk SSSR. Vestnik, 1962, v. 32, no. 9, p. 78-85.

Descriptors: (*Ecology, Meteorological parameters), (*Meteorological parameters, Ecology), Climatology, Meteorology, Theory, USSR.

The problem of active reaction to meteorological processes, as well as other problems of transforming nature, is discussed. The problem of active reaction is defined as that field of knowledge, which is directly connected with the reaction of society and surrounding nature.

AD-607 498 Div. 2, 20
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NUCLEAR EXPLOSION OVER THE TAIGA,
by F. Yu. Zigel'. 15 Oct 64, 19p
FTD TT64 228; TT 64 71602

Unclassified report

Unedited rough draft trans. of Znanie-Sila (USSR) 1961, v. 36, no. 12, p. 24-27.

Descriptors: (*Nuclear explosions, Siberia), (*Meteorites, Siberia), (*Siberia, Explosions), Comets, Explosion damage, Siberia, Nuclear energy, Terrestial magnetism, Trajectories, USSR, Shock waves.

Data are reviewed suggesting that the mysterious body which exploded on 30 June 1908 in the Siberian taiga near the Tunguska River released nuclear energy and that the explosion was actually some sort of nuclear blast. An examination of previously established information shows that the body could not have been a meteorite nor a comet. Data obtained by a 1958-1961 expedition led by the Ural geophysicist A. V. Zolotov and sponsored by the USSR Academy of Sciences indicates that the body was travelling at a velocity of about 3 kilometers a second and that the source of the explosion could not have been the kinetic energy of the body, but was its internal energy. Other evidence obtained by the Zolotov expedition shows that the radiant energy of the explosion was about 10 to the 23 power ergs. The body was apparently flying from the SW towards the NE. Furthermore, the explosion was directive. The directivity of the explosion leads Zolotov to conclude that the explosive nuclear substance was contained in a non-explosive shell.

the technique of measurement as well as the theory of radio wave interaction have been extended and generalized at the Ionosphere Research Laboratory by the introduction of complex coefficient of interaction T, to embody the effect of interaction on both the amplitude and the phase of radio waves.

AD-607 688 Div. 2, 25
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RADIATION OF PLASMA IN A MAGNETIC FIELD,
by B. A. Trubnikov. 8 Oct 58, 13p T-101
TT 64 71627

Unclassified report

Trans. of Akademiya Nauk SSSR. Doklady, 1958, v. 118, no. 5, p. 913-916.

Descriptors: (*Radio astronomy, Plasma physics), (*Plasma medium, Line spectrum), Electrons, Magnetic fields, Harmonic analysis, Potential theory, Solar corona, Galaxies, Extraterrestrial radio waves, USSR.

The radiation of plasma and the associated spiraling of electrons in a uniform magnetic field is examined. The spectrum of radiation of a high speed electron moving in a magnetic field, is made up, as is known of discrete lines - harmonics. Keeping in mind the application to radioastronomy of the sun and the galaxies, consideration is given to the high harmonics of the spectrum.

AD-607 722 Div. 2, 24
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
COLOR CONTRASTS ON THE LUNAR SURFACE,
by N. P. Barabascheff. 21 Sep 64, 13p
RSIC 271; TT 64 71632

Unclassified report

Trans. of Priroda (USSR) 1953, v. 42, no. 12, p. 88-90.

Descriptors: (*Moon, Colors), (*Colors, Moon), Color photography, Luminescence, Lunar environment, Atmosphere, Rocks (Geology), Seas, Photographs, Spectra (Visible and ultraviolet), Surface properties, Ultraviolet spectroscopy.

On the basis of colored photographs and spectrophotometric observations of the moon, it was concluded that together with dark greenish species on the moon, dark red spots and lines are also present. It is believed that these colored shades on the moon, as on earth, must be due mainly to iron combinations which are usual for rock formations.

AD-607 724 Div. 2, 24
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
ON THE PROBLEM OF PHOTOMETRIC UNIFORMITY OF THE MOON'S SURFACE,
by N. P. Barabashov, V. A. Ezerskaya, V. I. Ezerskii, and T. I. Ishutina. 9 Oct 64, 23p
RSIC 304; TT 64 71634

Unclassified report

Trans. of Akademiya Nauk SSSR. Komissiya po Fizike Planet. Izvestiya, 1959, v. 1, p. 67-79.

Descriptors: (*Moon, Surface properties), (*Porosity, Moon), Photographs, Optical analysis, Optical properties, Luminescence, Brightness.

On the basis of V. A. Fedorets' catalogue of reflectivity of the Moon's features and by specially performed measuring of the Moon's photographs it was established that the Moon's surface is characterized by a high degree of photometric uniformity, i.e. on the average, has the same porosity. (Author)

AD-607 725 Div. 2, 12
OTS Prices: HC $3.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
THE NATURAL ENVIRONMENT FOR THE MANNED ORBITING LABORATORY SYSTEM PROGRAM (MOL).
Special reports.
25 Oct 64, 52p
AFCRL 64 845; AFCRL SR 7

Unclassified report

Descriptors: (*Space stations, Space environmental conditions), (*Space environmental conditions, Space stations), Orbital trajectories, Upper atmosphere, Terrestrial magnetism, Solar flares, Cosmic rays, Ultraviolet radiation, Laboratories, Manned, Temperature, Electron density, Particles, Computers, Geophysics.

The natural environment of the Manned Orbiting Laboratory (MOL) in a near-earth orbit is described. Parametric information based primarily on material from the forthcoming Handbook of Geophysics and Space Environments (in press), is provided on the upper atmosphere, the geomagnetic field, corpuscular radiation, meteoroids, and the sun. In addition, a selected bibliography on these subjects is provided as a guide to sources of more detailed information than could be included in the report. (Author)

AD-607 743 Div. 2, 15
OTS Prices: HC $3.00/MF $0.75

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
NUMERICAL STUDIES OF FRONTAL MOTION IN THE ATMOSPHERE, I,
by A. Kasahara, E. Isaacson, and J. J. Stoker.
Sep 64, 63p NYO-1480-6
Contracts AT30 1 1480, Nonr285 55
TID 4500 32nd ed.

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Air mass analysis, Numerical analysis), (*Numerical analysis, Air mass analysis), Differential equations, Atmosphere models, Incompressible flow, Fluid flow, Difference equations, Boundary value problems.

The motion of frontal disturbances in the atmosphere was studied by the numerical solution of differential equations based upon a two-layer model of an incompressible fluid on a rotating earth. The density of each layer was assumed to be constant. The upper and lower fluids correspond respectively to warm and cold air. In this first attempt, only the motion of the lower cold air layer is studied by assuming, in effect, that the dynamics of the perturbations in the upper warm air layer

and Sgr A (35 Gc) flux densities were 420 ± 60 x 10 to the minus 26th power w/sq m/cps and 290 ± 100 x 10 to the minus 26th power w/sq m/cps, respectively. The flux density of Tau A (70 Gc) interpreted from an antenna temperature signal to noise ratio of approximately 2 to 1 was 790 ± 450 x 10 to the minus 26th power w/sq m/cps. Observations of 94 Gc of Sgr A, having a calculated antenna temperature standard deviation of 0.2C, revealed no source of radiation at the central position of Sgr A (35 Gc). The 35 Gc position of Tau A and Sgr A coincided, within the limits of the measuring accuracy ± 3 (s) R. A. and ±1' Dec., with lower frequency source positions. (Author)

AD-607 570 Div. 2
OTS Prices: HC $2.00/MF $0.50

Boeing Scientific Research Labs., Seattle, Wash.
A CONTOUR MAP OF THE MOON,
by C. L. Goudas. Oct 64, 42p
D1-82-0376, Boeing-Math-369

Unclassified report

Also available from the author.

Descriptors: (*Moon, Maps), (*Maps, Moon), Extra-terrestrial topography, Mapping, Numerical methods and procedures, Astronomy.

The lunar elevation data provided by Schrutka-Rechtenstamm supplemented by similar data near the limbs provided by Davidson and Brooks, were used to determine the equation of surface of the Moon as a sum of spherical harmonics including terms up to the eighth order. This equation was used to construct a contour map of the Moon. The same work was repeated for data provided by Baldwin which also were supplemented by the same data by Davidson and Brooks. The two maps have some basic similarities. After improving the equation of surface derived from Schrutka's data in a way that a homogeneous Moon with this equation of surface would also satisfy the conditions, f = 0.633 (Koziel, 1964), beta = 0.0006267 (Jeffreys, 1959), gamma = 0.0002274 (Jeffreys, 1961), a third contour map which seems to be more realistic than the previous two is derived. (Author)

AD-607 622 Div. 2, 16
OTS Prices: HC $4.00/MF $1.00

Pacific Science Board, National Research Council, Washington, D. C.
ATOLL RESEARCH BULLETIN, NOS. 101-108.
30 Sep 64, 131p
Contract Nonr2300 12

Unclassified report

Descriptors: (*Indian Ocean islands, Coral reefs), (*Pacific Ocean islands, Coral reefs), (*Coral reefs, Ecology), Biology, Marine biology, Geography, Plants (Botany), Rocks (Geology), Algae, Birds, Sedimentation, Geology, Soils, Animals.

Contents: Notes on Indian Ocean atolls visited by the Yale Seychelles Expedition; Notes on reef habitats and gastropod molluscs of a lagoon island at North Male Atoll, Maldives; Observations on the birds of French Frigate Shoal and Kure Atoll; Carbonate sediments of Half Moon Cay, British Honduras; Floristic report on the marine benthic algae of selected islands in the Gilbert Group; New records of Halimeda and Udotea for the Pacific area; Place names on Nukuroro Atoll; Atoll News and Comment.

AD-607 633 Div. 2, 12, 15
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A BIBLIOGRAPHY FOR THE RESTRICTED THREE-BODY PROBLEM,
by Peter L. Duren. 25 Aug 58, 26p
STL/GM-TN-0165-00172

Unclassified report

Descriptors: (*N-body problem, Bibliographies), (*Bibliographies, N-body problem), Celestial mechanics, Lunar trajectories, Orbital trajectories, Equations, Motion, Series.

The 78 references in this bibliography are arranged chronologically within each of three headings: expository, analytical and numerical.

AD-607 644 Div. 2, 12, 30
OTS Prices: HC $11.45/MF $3.50

National Weather Satellite Center, Weather Bureau, Washington, D. C.
PROCEEDINGS OF SYMPOSIUM ON SPACE 'WEATHER' HELD AT AIRLIE HOUSE, WARRENTON, VIRGINIA.
ed. by Laurence H. Clark. Jul 64, 844p

Unclassified report

Co-sponsored by Interdepartmental Committee for Atmospheric Sciences.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Space environmental conditions, Symposia), (*Atmosphere, Symposia), (*Astrophysics, Symposia), Astronautics, Spacecraft, Space communication systems, Radiofrequency interference, Solar radiation, Space medicine, Space surveillance systems, Nuclear explosions, Magnetic fields, Solar wind, Scientific organizations, Scientific personnel, Geophysics.

Properties and conditions of the outer regions of the earth's atmosphere (above about 15 km where extra-terrestrial effects may begin to become important) and of interplanetary space are discussed. Effects of energetic particles, solar UV and x-ray radiation on the medium and on vehicles, their contents and their missions are also examined.

AD-607 686 Div. 2, 8
OTS Prices: HC $3.00/MF $0.75

Ionosphere Research Lab., Pennsylvania State Univ., University Park.
THE MEASUREMENT OF PHASE AND AMPLITUDE RADIO WAVE INTERACTION AT UNIVERSITY PARK, PENNSYLVANIA, FOR APRIL-MAY-JUNE, 1964.
Scientific rept. for 1 Apr-30 Jun 64,
by A. J. Ferraro and H. S. Lee. 1 Sep 64, 62p
IRL-224
Contract AF19 628 4014; Grant NSF GP846, Proj. 8605, Task 860502
AFCRL 64 824

Unclassified report

Descriptors: (*Ionosphere, Luxemberg effect), (*Luxemberg effect, Measurements), Ionosphere, Radio waves, Ionospheric propagation, Attenuation, Phase measurement, Mathematical analysis, Electron density.

This report describes the results of the measurement of phase and amplitude radio wave interaction. The objective of this work is to study the properties of ionospheric D-region using radio wave interaction effect which is also commonly known as Luxembourg effect. The technique closely follows that developed by Fejer (1955) for radio wave amplitude interaction experiment. However,

OCEAN-BOTTOM SEISMOMETER DATA COLLECTION AND ANALYSIS.
Final rept.,
by William A. Schneider. 12 Oct 64, 120p
Contract AF19 604 8368, Proj. 8652,
ARPA Order 292 62, Task 865205
AFCRL 64 666

Unclassified report

Rept. on Proj. Vela-Uniform.
A portion of the original document contains fine detail which may make reading of photocopy difficult. The initial distribution copies contain color which will be shown in black-and-white when it is necessary to reprint.

Descriptors: (*Nuclear explosions, Detection), (*Ocean bottom, Seismographs), (*Seismographs, Nuclear explosions), Signal-to-noise ratio, Underwater equipment, Equations, Pressure, Velocity, Pacific Ocean, Hawaii, Aleutian islands, California.

Ocean-bottom data from three independent geographical locations in the Pacific Ocean has been studied for consideration of means of detecting and identification of underground or underwater nuclear explosions. Signal-to-noise ratios on the ocean bottom are generally inferior to those at a land control station by 0 to -10 db in two of the three areas. The superior ocean-bottom (S/N) ratios in the Hawaii area are due principally to a 'noisy' land site. The study reveals no consistant differences in phase development between the ocean bottom and land other than effects associated with the free surface and the late arriving T phase. For near regional and local events, the ocean-bottom seismogram often shows greater high frequency energy content than on land. Ocean-bottom magnification of signal energy by as much as 20 db is consistently observed for teleseisms and occassionally for near regional and local events. Ambient noise levels on the ocean bottom are greater than at a land control station by about 20 db at the low frequencies in all three areas. The difference decreases with increasing frequency. (Author)

AD-607 814 Div. 2, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
EXPLORATION OF THE TERRESTRIAL RADIATION BELT,
by John W. Lindner. 18 Mar 59, 32p
STL/TR-59-0000-00625

Unclassified report

Descriptors: (*Space environmental conditions, Exploration), Scientific satellites, Space probes, Cosmic rays, Van Allen radiation belt, Radiation measurement systems, Astrophysics, Experimental data.

Summarization of the results of Explorer 1, 2, 4 and Pioneer 1, 2, and 3 space probes.

AD-607 840 Div. 2, 6
OTS Prices: HC $2.00/MF $0.50

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
ATMOSPHERIC TRANSMISSION OF INFRARED.
Technical Information Series,
by T. Altshuler. Feb 60, 31p R59ELC115

Unclassified report

Prepared for presentation at the Institute of Radio Engineers in New York City, 2 November 1959.

Descriptors: (*Atmosphere, Infrared phenomena), (*Infrared radiation, Absorption), Scattering, Attenuation, Infrared detectors, Water vapor, Carbon dioxide, Absorption spectrum.

The fundamentals of atmospheric molecular absorption and radiation of infrared are discussed, and a procedure for determining this absorption is presented. In addition to molecular absorption, infrared is attenuated by scattering which results from atmospheric particles such as haze, clouds, fog, etc. The scattering phenomenon is covered briefly. The inapplicability of the Lambert-Beer absorption law when considering band spectral absorption by atmospheric gases is demonstrated. The absorption behavior is more closely approximated by various models, for example, the Elsasser, King, Goody, Plass, and the Elder and Streng 'window' models as well as empirical model. Other topics discussed are the background radiation, pressure broadening, models for the distribution of various atmospheric gases, and a sample transmission calculation. (Author)

AD-607 859 Div. 2, 25
OTS Prices: HC $3.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
ATMOSPHERIC ATTENUATION MODEL, 1964, IN THE ULTRA-VIOLET, VISIBLE, AND INFRARED REGIONS FOR ALTITUDES TO 50 m.
Environmental Research Papers,
by L. Elterman. Sep 64, 54p
Proj. 7670
AFCRL 64 740; AFCRL ERP46

Unclassified report

Descriptors: (*Atmosphere models, Attenuation), Atmosphere, Mathematical models, Optical properties, Infrared radiation, Ultraviolet radiation, Light transmission, Absorption, Ozone, Aerosols, Optics, Tables, Geophysics.

A model of a clear standard atmosphere, for determing attenuation in the ultraviolet, the visible, and the infrared windows, is derived. The derivation is based on a Rayleigh atmosphere combined with aerosol and ozone components. The format of the model is a series of tabulations for 22 wavelengths with Rayleigh, aerosol, and ozone components arrayed at kilometer intervals to an altitude of 50 kilometers. Exploratory calculations pertaining to horizontal, vertical, and slant-path transmission from sea level, transmission between two altitudes and transmission to space are readily made from the tabulations. Because of its more extensive coverage and improved computational programming, this report, including the tabulations, fully replaces the earlier publication, 'A Model of a Clear Standard Atmosphere for Attenuation in the Visible Region and Infrared Windows,' by this author. (Author)

AD-607 860 Div. 2
OTS Prices: HC $4.00/MF $1.00

Sacramento Peak Observatory, Sunspot, N. Mex.
A STUDY OF THE FINE STRUCTURES IN THE SOLAR CHROMOSPHERE.
Environmental Research Papers,
by J. M. Beckers. Sep 64, 137p
Proj. 7649
AFCRL 64 770; AFCRL erp 49

Unclassified report

Doctoral thesis.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Solar atmosphere, Astronomical data),

can be neglected. The numerical study of this simple mechanical model shows that even though thermodynamic processes have been ignored, the occlusion process, characteristic for warm and cold fronts, develops from an initially sinusoidal frontal pattern. Two cases of different initial conditions were examined.

AD-607 753 Div. 2
OTS Prices: HC $1.00/MF $0.50

Harvard Coll., Cambridge, Mass. Observatory.
RESEARCH DIRECTED TOWARD THE OBSERVATION AND INTERPRETATION OF SOLAR PHENOMENA.
Final rept.,
by Howard L. deMastus and Donald H. Menzel. Oct 64, 23p
Contract AF19 604 4961, Proj. 7649, Task 764902
AFCRL 64 712

Unclassified report

Work will be continued under Contract AF19 628 3322.

Descriptors: (*Solar atmosphere, Scientific research), (*Solar corona, Scientific research), Solar flares, Sun, Sunspots, Spectroscopy, Cameras, Photographic equipment, Astronomical observatories.

Refinements and continued operation of the combination H alpha prominence and green coronal camera provided motion pictures and daily surveys of prominences and corona. The H alpha flare patrol underwent significant improvements, and data acquisition rates were increased. Patrol observers became further engaged in both flare warning and subjective prediction services. Spectrographic observations of the solar corona and transient limb phenomena provided a continuation of routinely observed green and red coronal emission lines as well as a vast collection of special observations of bright limb phenomena. A white-light sunspot camera gave pictures of sunspots, granulation, and fine structure. Various theoretical and analysis studies were undertaken, based on the extensive patrol data, and on data from the Sacramento Peak 16-inch coronagraph and coelostat systems and their auxiliary spectrographs. (Author)

AD-607 761 Div. 2, 25
OTS Prices: HC $2.00/MF $0.50

American Science and Engineering, Inc., Cambridge, Mass.
ANALYSIS OF PERFORMANCE OF A ROCKET-BORNE RETARDING POTENTIAL ANALYZER.
Final rept.,
by Oscar P. Manley. May 64, 43p ASE-608
Contract AF19 604 8849, Proj. 8653, Task 865302
AFCRL 64 769

Unclassified report

Research sponsored by the Defense Atomic Support Agency, Washington, D. C.

Descriptors: (*Ionization potentials, Ionosphere), (*Ionosphere, Gas ionization), (*Gas ionization, Measurement), Spaceborne, Ions, Ionic current, Density, Electron density, Electrostatics, Aerodynamic heating, Shock waves, Velocity, Plasma sheath, Mathematical analysis, Atmospheric sounding.

The use of a rocket-borne retarding potential analyzer (RPA) for determining positive ion densities in the ionosphere is studied. It is shown that at the altitudes of interest (40 to 90 km) shock ionization induced by the nose-cone may exceed ambient ionization. Moreover, the positive ion current measured by means of the RPA is not linearly dependent on the ion density; at present, the precise functional dependence between the two quantities cannot be established analytically. (Author)

AD-607 762 Div. 2, 25, 30
OTS Prices: HC $3.00/MF $0.75

Northeastern Univ., Boston, Mass.
RESEARCH ON AIRGLOW PHENOMENA USING INSTRUMENTATION TECHNIQUES.
Final rept.,
by William F. Bellew, Basil L. Cochrun, Richard E. Grojean, Elmer J. Layman, and Louis J. Nardone.
10 Apr 64, 75p
Contract AF19 604 7307, Proj. 8627, Task 862705
AFCRL 64 343

Unclassified report

Descriptors: (*Sky brightness, Measurement), (*Optical instruments, Sky brightness), Night sky, Upper atmosphere, Atmospheric sounding, Sounding rockets, Photometers, Portable, Spaceborne, Atomic spectroscopy, Molecular spectroscopy, Optical equipment, Calibration, Magnetic storms, Light, Intensity, Instrumentation, Design, Test methods.

Work was conducted on the design, construction and testing of instrumentation for the study of day and night airglow phenomena. Descriptions are given of rocket-borne instruments used for the measurement of day airglow. For daytime emissions, preliminary results indicate intensities of 500 rayleighs for the 5577A [OI] line, 1.5 kilorayleighs for the 5893A [NaI] doublet and less than 2 kilorayleighs for the 6300A [OI] line. Several special studies are presented on the night airglow data available, particularly in regard to the 5577A and 6300A line emissions. Description is given of a portable, battery-operated filter photometer for the measurement of night air-glow emissions. It was designed as the data collecting device for the various stations required for a study of the latitudinal variation of night sky emissions. In the case of both day and night airglow photometers, the required calibration procedures were developed along with the design and development of the instruments. A procedure for performing the calibrations and a description of the optical dark room facility are given. (Author)

AD-607 776 Div. 2
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
SHORT REVIEW OF GEOMAGNETISM,
by E. H. Vestine. Oct 64, 95p P-2996

Unclassified report

This paper was prepared for inclusion in the International Dictionary of Geophysics, S. K. Runcorn (ed.), Pergamon Press.

Descriptors: (*Terrestrial magnetism, Scientific research), Magnetic properties, Mathematical analysis, Fourier analysis, Special function (Mathematical), Earth, Maps, Ionosphere, Surface properties, Upper atmosphere, Solar disturbances, Magnetic storms, Magnetic fields.

A report studying of the earth's magnetic field and some of the associated properties and phenomena are presented.

AD-607 785 Div. 2
OTS Prices: HC $4.00/MF $0.75

Texas Instruments, Inc., Dallas.

Final rept.,
by A. N. Hull, R. W. Titus, and H. F. Mueller. Jun 64, 42p
ARPA VUF1008

Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63. Sponsored also by the Atomic Energy Commission, Washington, D. C.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Nuclear explosions, Meteorological parameters), (*Weather forecasting, Nuclear explosions), Radiation hazards, Radioactive fallout, Dose rate, Wind, Temperature, Underground explosions, Nevada.

The Weather and Surface Radiation Prediction Unit commenced preliminary weather observations at the SHOAL Site in August 1962. Sufficient data was collected to insure statistical significance. Commencing on D-30, a complete weather analysis and forecasting unit was in operation at the SHOAL Site. The weather facilities, observation schedules, detailed pre-shot weather and radiation forecasts, and their verification are discussed. (Author)

AD-607 924 Div. 2
OTS Prices: HC $0.50/MF $0.50

Joint Publications Research Service, Washington, D. C.
NONPERIODIC OSCILLATIONS OF THE ALTITUDE OF THE TROPOPAUSE IN CONNECTION WITH SYNOPTIC PROCESSES,
by E. M. Orlova. 24 Apr 59, 14p JPRS(DC)-674
TT 59 11522

Unclassified report

Trans. of Meteorologiya i Gidrologiya (USSR) 1958, no. 7, p. 3-10.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Tropopause, Oscillation), (*Atmospheric motion, Air mass analysis), Weather forecasting, Thermodynamics, Cyclones, Anticyclones, Convection, Meteorology.

The present article describes the extent to which oscillations (variations) of the altitude of the tropopause depend on processes in the lower troposphere and how, on the basis of these processes, the sign and magnitude of the change in the altitude of the tropopause may be judged. The exposition of this relationship is of practical interest since, in preparing the weather forecast, the forecaster does not compute local temperature changes at altitudes in the region of the tropopause that depend on the aforementioned factors.

AD-607 926 Div. 2, 12, 24
OTS Prices: HC $2.00/MF $0.50

Yerkes Observatory, Williams Bay, Wis.
ON THE PERFORMANCE OF THE BENDIX LUMICON WITH ASTRONOMICAL OBJECTS.
Final rept. for Dec 58-Jul 59,
by Gerard P. Kuiper. Sep 59, 34p
Contract AF19 604 4540, Proj. 1773, Task 17733
AFCRL TN59 637; AFCRL GRDST9

Unclassified report

Descriptors: (*Astronomical cameras, Performance (Engineering)), (*Tracking cameras, Satellites (Artificial)), Astronomical observatories, Astronomical data, Tracking telescopes, Moon, Planets, Photography, Photographic emulsions, Images, Nebulae.

A series of astronomical and some laboratory tests were made with the Bendix-Friez Lumicon during the period December 1958 to July 1959 at the Yerkes and McDonald Observatories. The object of these tests was to assess the suitability of the Lumicon as a tool for astronomical research, including the discovery and observation of artificial satellites. The Lumicon was equipped with a General Electric No. Z-5294 Image Orthicon. Relevant notes, comments, and recommendations are given which may assist in further tests or in future developments of the apparatus. Three series of astronomical tests were run: (1) at Yerkes Observatory during December 1958 and January 1959; (2) at McDonald Observatory during March 1959; and (3) at Yerkes Observatory during July 1959. The Yerkes tests included observations of the Moon, Venus, Mars, Jupiter, Saturn, star fields, and nebulae, with the 40-inch telescope. Further, tests with three short-focus, wide-angle lenses, for the recording of stars to the limiting magnitude, both for stationary star fields and fields moving at the rate of 1 degree per second (typical satellite velocity). The McDonald tests included similar observations with the 82-inch reflector, placed at 6800 feet elevation, and with two of the three short-focus lenses.

AD-607 936 Div. 2, 5
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
LUNAR PROBE TELEMETER SYSTEM DEVELOPMENT,
by A. W. Newberry. 25 Sep 58, 18p
STL/GM-TN-0165-00187

Unclassified report

Presented at National Telemetry Symposium (I.R.E.). Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Lunar probes, Telemeter systems), (*Telemeter systems, Lunar probes), Systems engineering, Astronautics, Space communication systems, Guided missiles, Rockets, Spacecraft, Payload, Instrumentation.

Studies made to determine the most promising approaches to communication systems, missile configurations, trajectories, and experiments are described.

AD-607 944 Div. 2
OTS Prices: HC $3.00/MF $0.75

Atmospheric Research Group, Altadena, Calif.
THE EFFECTS OF WIND AND PRECIPITATION ON THE MODIFICATION OF SOUTH BEACH, CRESCENT CITY, CALIFORNIA, INCLUDING AN APPENDIX ON THE FOCUSING OF TSUNAMI ENERGY AT CRESCENT CITY.
Final rept.,
by James A. Roberts and Erwin K. Kauper. 14 Oct 64, 98p ARG-64-FR-186
Contract DA49 092ARO38

Unclassified report

Descriptors: (*Beaches, Configuration), (*Ocean waves, Earthquakes), Wind, Atmospheric precipitation, Marine meteorology, Marine geology, Oceanology, California, Erosion.

The effects of a tsunami, generated by the Alaskan earthquake of 27 March 1964, on the beaches in the Crescent City area of northwestern California were examined. The observations were extended to a general analysis of the effects of subaerial processes on the formation of beaches.

Solar disturbances, Sunspots, Optical filters, Spectroscopy, Doppler effect, Atomic energy levels, Hydrogen, Calcium.

The main part of the paper is concerned with a spectroheliographic study in the light of the Hydrogen H-alpha line (6562.8A) and of the Calcium K line (3933.7A). A description is given of the instrumentation used to secure the observations. Some of the properties of the Sydney 1/8 A H-alpha birefringent filter are given in detail. A description is given of the high-resolution H-alpha filtergrams obtained with this instrument with a comparison of this description with those given by other authors. The elongated fine mottles were studied in considerable detail. All of the properties agree with those for spicules. An attempt was made to measure the spectrum of such a spicule on the disk. The hydrogen spectrum of spicules was computed under non-local thermodynamic equilibrium conditions for the Lyman alpha, beta and gamma lines, the Balmer alpha and beta lines, and the Paschen alpha line. The appearance of the K spectroheliograms are described. Attention is drawn to the equality in birth rates for granules and spicules within the K flocculi, which indicates a physical relationship.

AD-607 879 Div. 2, 4
OTS Prices: HC $4.00/MF $0.75

Materials Research Lab., Pennsylvania State Univ., University Park.
THERMODYNAMICS AND KINETICS OF THE DEHYDROXYLATION OF HYDROUS MINERALS.
Scientific rept. no. 1, Apr 63-Aug 64,
by G. W. Brindley and Rustum Roy. Aug 64, 124p
Contract AF19 628 2773, Proj. 8602, Task 000011
AFCRL 64 817

Unclassified report

Descriptors: (*Moon, Water supplies), (*Water supplies, Minerals), (*Minerals, Dehydration), Furnaces, Hydrates, Water vapor, Vapor pressure, Rock (Geology), Particle size, Reaction kinetics, Thermodynamics, Enthalpy, Kaolinite, Diffusion, Heat of reaction, Lunar environment.

In order to design facilities for the thermal extraction of water from possible hydrous minerals on the moon, information concerning the pressure-temperature dehydration curves, the enthalpies of reaction, and the reaction kinetics is necessary so that optimum values can be chosen for such variables as (1) geometry and size of the furnace. (2) time, temperature and pressure of water vapor for dehydration, and (3) particle size of the hydrous mineral or rock. Using thermogravimetry at low pressures of water vapor, and differential thermal analysis at water vapor pressures ranging from 15 psi to 10,000 psi, the thermodynamics and kinetics of water extraction from serpentine, brucite, kaolinite, dickite, and halloysite were studied.

AD-607 896 Div. 2
OTS Prices: HC $1.00/MF $0.50

High Altitude Observatory, Boulder, Colo.
MECHANISM OF DECAMETER RADIATION.
Scientific rept. no. 5,
by J. W. Warwick. Sep 64, 22p
Contract AF19 628 224, Proj. 5629, Task 562902
AFCRL 64 774

Unclassified report

Paper presented at NASA Symposium on Jupiter, New York, 17 Oct 62.
Prepared in cooperation with Colorado Univ., Boulder.

Descriptors: (*Jupiter, Microwave spectroscopy), (*Extraterrestial radio waves, Jupiter), Radio astronomy, Magnetic fields, Planetary atmospheres, Microwaves, Emissivity, Dipole moments.

A brief review is given of the principal results of dynamic spectral studies of Jupiter's decametric emission. The argument for a permanent dynamic spectrum, e.g. a function of radio longitude only, is worked out in detail. Its implication for Jupiter's magnetic field is discussed in detail. A number of pictures of actual records appear at the end of the report. (Author)

AD-607 898 Div. 2, 9
OTS Prices: HC $6.00/MF $1.25

Davies (Edward) Chemical Lab., Univ. Coll. of Wales, Aberystwyth.
LARGE SCALE MOVEMENTS OF THE ATMOSPHERE.
Technical note no. 1,
by Pauline Ramm. Jul 64, 218p
Contract AF61 052 690
AFCRL 64 852

Unclassified report

Descriptors: (*Atmospheric motion, Thermodynamics), (*Thermodynamics, Atmospheric motion), Thermal radiation, Fluid flow, Atmosphere, Equations, Convection, Magnetohydrodynamics, Boundary value problems, Meteorology.

A formulation of the full equations of motion for a fluid capable of absorbing and emitting grey thermal radiation is presented. The Rayleigh stability problem is investigated for models with a linear basic temperature profile under certain boundary conditions. In general it is found that in this formulation the presence of radiational absorption tends to stabilise the fluid. Finally, the forced motion of a liquid heated from below and subject to a non-linear basic temperature profile due to internal heat generation is discussed. (Author)

AD-607 914 Div. 2
OTS Prices: HC $3.00/MF $0.50

Space Sciences Lab., Univ. of California, Berkeley.
MICROPULSATION INDUCTION EFFECTS 15 to 40 SECONDS.
Technical rept.,
by Robert E. Warren. Jul 64, 55p SSL(UC)-5-45
Contract Nonr222 89

Unclassified report

Descriptors: (*Terrestrial magnetism, Measurement), Geophysics, Geophysical prospecting, Structural geology, Correlation techniques, Magnetometers, Mapping.

Observations of micropulsations in the vertical component of the geomagnetic field have been made at twenty-four sites along a profile from Monterey Bay to Yosemite, California. The character of the observations shows a correlation with the sediment-filled valleys traversed, although the relative amplitudes often appear larger than expected for electric currents induced strictly in the valleys. (Author)

AD-607 919 Div. 2, 20
OTS Prices: HC $2.00/MF $0.50

Weather Bureau Research Station, Las Vegas, Nev.
WEATHER AND SURFACE RADIATION PREDICTION.

4. Chemistry

AD-607 480 Div. 4, 12
OTS Prices: HC $3.00/MF $0.75

Amoco Chemicals Corp., Seymour, Ind.
A SOLID CHEMICAL AIR GENERATOR.
Technical rept. for Apr 63-Mar 64,
by Gavin H. Peters, James E. Aker, and E. F. Morello.
Sep 64, 95p AG-1
Contract AF33 657 11120, Proj. 6373, Task 637302
AMRL TDR64 71

Unclassified report

Descriptors: (*Gas generating systems, Design), (*Oxygen equipment, Gas generating systems), (*Manned spacecraft, Oxygen equipment), Air, Ammonium compounds, Nitrates, Nitrogen compounds, Oxides, Decomposition, Catalysts, Rhodium, Platinum, Nickel compounds, Barium compounds, Sodium compounds, Silicates, Impurities.

The development of a solid chemical air generator capable of producing a breathable, oxygen enriched atmosphere for possible space applications was investigated. In the initial phase, the direct decomposition of solid ammonium nitrate to produce the desired atmosphere was studied. This direct method of conversion was found to be impractical as the reaction products included nitrogen oxides regardless of the conditions of decomposition. During the next phase, various catalyst systems for decomposition of nitrous oxide were investigated since the reaction products contained about 40% of this gas and results indicated this gas could be controlled. The level of nitrous oxide in the reaction products could not be increased sufficiently to provide the desired oxygen level, and it was necessary to decompose the nitrogen dioxide present in the reaction gases. A compact unit was developed that was capable of decomposing solid ammonium nitrate at a controlled rate on demand and partially converting the gases to provide an atmosphere containing about 12% oxygen. (Author)

AD-607 511 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XXIII. THERMOCHEMICAL STUDY OF THE GERMANIUM OXIDES USING A MASS SPECTROMETER. THE DISSOCIATION ENERGY OF THE MOLECULE GeO,
by J. Drowart, F. Degreve, G. Verhaegen, and R. Colin. Sep 64, 38p
Contract AF61 052 225, Proj. 7350, Task 735001
WADD TR60 782 P23

Unclassified report

Descriptors: (*Thermochemistry, Germanium compounds), (*Germanium compounds, Oxides), Monoxides, Dioxides, Mass spectroscopy, Dissociation, Vaporization, Vapor pressure, Enthalpy, Disproportionation, Stability, Polymerization, Heat of formation, Heat of sublimation, Belgium.

A mass spectrometric study of the vaporization of the compounds GeO2 (hex) and GeO(am) and of the mixture GeO2(hex) + Ge(c) made it possible to establish their mode of vaporization: (I) GeO2(hex) - GeO(g) + I/2O2; (II) n GeO(am) - (GeO)n(g) (n=1, 2, 3); (III) n/2 GeO2(hex) + n/2 Ge(c) - (GeO)n(g) (n = 1, 2, 3). The enthalpies of vaporization at 298K are: (I) = 121.2±1.6 kcal/mole; (II, n = 1) = 53.4±1.0 kcal/mole; (III, n = 1) = 58.2±1.0 kcal/mole. The polymerization energies at 298K are: (GeO-GeO) = 44.7±3.0 kcal/mole; (GeO-GeO-GeO)= 88.5±5.0 kcal/mole. Total pressures given in the literature were reinterpreted taking the presence of the polymers into account. The heat of formation of the metastable compound GeO(am) obtained is -59.6 ± 0.7 kcal/mole. The dissociation energy of the gaseous molecule GeO is 157.4±1.5 kcal/mole. (Author)

AD-607 585 Div. 4, 17
OTS Prices: HC $1.00/MF $0.50

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF MINUTE QUANTITIES OF SELECTED ELEMENTS IN BERYLLIUM.
Interim rept. no. 3, 20 May-20 Jul 64,
by W. M. Henry. 20 Jul 64, 22p
Contract NOw64 0081c

Unclassified report

See also AD-603 756.

Descriptors: (*Beryllium, Chemical analysis), Impurities, Purification, Spectroscopy, Electron Guns, Mass spectroscopy, Carbon, Melting, Oxygen, Standards, Electrodes, Cleaning.

The efforts discussed in the report were principally in the areas of (1) obtaining additional high-purity beryllium materials, (2) development of a sensitive emission spectrographic technique, (3) additional effort in mass spectrography on evaluating plates and in the assembly of an electron-beam sample-cleaning gun, (4) the investigation of a vacuum-fusion extraction method to determine carbon in beryllium, and (5) the preparation of enriched-oxygen-in-beryllium standards. (Author)

AD-607 616 Div. 4, 10
OTS Prices: HC $1.00/MF $0.50

Idaho Univ., Moscow.
NEW HYPOFLUORITES CONTAINING NITROGEN.
Annual rept. no. 1,
by Jean'ne M. Shreeve. 1 Oct 64, 9p
Contract Nonr4217 00, ARPA Order 442

Unclassified report

Descriptors: (*Oxidizers, Synthesis (Chemistry)), (*Oxyfluorides, Synthesis (Chemistry)), (*Nitrogen compounds, Oxyfluorides), Fluorination, Catalysis, Stability, Pyrolysis, Ultraviolet radiation, Chemical analysis, Amines, Nitrates, Methane, Hydrazine derivatives.

Attempts to prepare NF2OF by (1) the fluorination of nitric oxide; (2) the reaction of N2F4 + HgO; and (3) the catalytic fluorination of NF2OSO2F, were unsuccessful. Some preliminary data on the thermal decomposition of NF2OSO2F are included. Catalytic fluorination of trifluoro nitrosomethane yielded (CF3)2NOCF3 which was more completely characterized and very likely CF3(F) NOCF3 is also produced. As the other member of this series, NF2OCF3 was prepared and partially characterized. (CF3)2NOCF3 is stable to at least 200C even in the presence of equimolar amounts of elemental fluorine. The thermal decomposition of CF3C(O)ONO also gives (CF3)2NOCF3 in about 5% yields. (Author)

AD-607 693 Div. 4
OTS Prices: HC $1.00/MF $0.50

Dynatech Corp., Cambridge, Mass.
STUDY OF OXIDES FOR O2-N2 SEPARATION.

AD-607 950 Div. 2, 8, 20
OTS Prices: HC $3.00/MF $0.75

Boeing Scientific Research Labs., Seattle, Wash.
GEOPHYSICAL EFFECTS OF HIGH ALTITUDE NUCLEAR EXPLOSIONS,
by J. F. Kenney and H. R. Willard. Aug 64, 74p
D1-82-0372

Unclassified report

Prepared for presentation at the Regional IQSY Meeting, Buenos Aires, 3-8 Aug 64.
Also available from the authors.

Descriptors: (*Nuclear explosions, High altitude), (*Geophysics, Explosion effects), Atmosphere, Explosions, Nuclear particles, Ionospheric disturbances, Magnetic properties, Ionospheric propagation, Very low frequency, Radio interference.

In 1962, both the Russians and the Americans conducted a series of high altitude nuclear explosions which and widespread geophysical effects. A study of these effects is useful to the geophysicist if it will shed light on the mechanisms responsible for similar geophysical phenomena which are noted in association with normally occurring disturbances. This paper presents a review of the effects of nuclear testing, with special emphasis on the trapped radiation, the ionosphere, and magnetic disturbances. An interpretation of these different phenomena is made. (Author)

AD-607 958 Div. 2
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
DETERMINATION OF THE POLARIZATION OF THE LUNAR AUREOLE,
by Yu. N. Lipskii. 9 Oct 64, 25p
RSIC 303; TT 64 71657

Unclassified report

Trans. of Moscow Univ. Gosudarstvennyi Astronomicheskii Institut. Soobshcheniya (USSR) 1951, v. 80, p. 3-17.

Descriptors: (*Lunar environment, Illumination), (*Light, Polarization), (*Polarization, Determination), Astrophysics, Diffusion, Brightness, Moon, Mathematical analysis, USSR.

AD-607 959 Div. 2
OTS Prices: HC $1.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
A COMPARISON OF THE LAW OF LIGHT REFLECTION AS RELATED TO THE MOON AND TO SOME ROCK VARIETIES,
by N. S. Orlova. 9 Oct 64, 12p
RSIC 301; TT 64 71658

Unclassified report

Trans. of Leningrad Univ. Vestnik (USSR) 1957, v. 12, no. 1, Seriya Matematiki, Mekhaniki i Astronomi, no. 1, p. 152-157.

Descriptors: (*Moon, Optical properties), Extraterrestrial topography, Earth, Rock (Geology), Light, Reflection, Correlation techniques, USSR.

A distribution pattern of the reflected radiant flux is considered to be one of the most significant photometric characteristics used for judging the probable nature of the Moon's surface. This communication presents results of juxtaposing the indicatrix of reflection of the Moon's surface with indicatrixes for smooth natural surfaces of the fracture of rock specimens having a usual museum size, i.e. of the order of several centimeters. In all experiments, surfaces were selected showing no indications of weathering or of any other changes due to factors acting after the rock was formed.

3. Chemical Warfare Equipment and Materials

AD-607 490 Div. 3, 4
OTS Prices: HC $1.00/MF $0.50

Naval Ammunition Depot, Crane, Ind.
RELATIONSHIPS OBSERVED IN COLORED FLAMES,
by B. E. Douda. 25 Sep 64, 20p
NAD-CI RDTR 45

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Colored flares, Flames), (*Flames, Chromatographic analysis), Colors, Line spectrum, Sodium, Magnesium, Barium, Strontium, Excitation, Impurities.

Excitation purity of a sodium-yellow flame was observed to be a decreasing function of the magnesium content in the flare. The chromaticity coordinates representing a wide variety of sodium-yellow, barium-green and strontium-red flares when plotted on a chromaticity diagram appear to take the form of straight lines which converge toward a common point. Several theories are proposed to explain the observations, the convergence point and the intercept point of the convergence line with the chromaticity diagram perimeter. (Author)

Electrochemical reactions at metal-crystalline salt interfaces were investigated. The cathodic reduction of silver ion, mercuric ion, cupric ion, and thallous ion gave characteristic current voltage patterns from which information about the electrode reactions could be deduced. The reduction of oxygen gas and water, and the oxidation of iodide were also observed. Applications of electrical methods to chemical analysis are discussed. (Author)

AD-607 947 Div. 4
OTS Prices: HC $2.00/MF $0.50

Callery Chemical Co., Pa.
STUDIES OF COMPLEX PERCHLORATES.
Annual rept.
by C. R. Guibert, H. F. Klodowski, and A. D. McElroy.
27 Oct 64, 28p
Contract Nonr3943 00 Unclassified report

Descriptors: (*Perchlorates, Complex compounds), (*Complex compounds, Perchlorates), Synthesis (Chemistry), Beryllium compounds, Zinc compounds, Aluminum compounds, Lithium compounds, Silicon compounds, Ammonium compounds, Nitrates, Nitrites, Methyl radicals, Nitronium perchlorate, Organic nitrogen compounds, X-ray diffraction analysis, Raman spectroscopy, Infrared spectroscopy.

One complex perchlorate of beryllium ((NO2)2Be(ClO4)4) has been prepared and characterized, but efforts to prepare other beryllium derivatives were unsuccessful. A complex perchlorate having silicon as the central element could not be prepared. Prelininary efforts to synthesize ((CH3)4N)3Al(NO3)6 have given encouraging results. Infrared and Raman spectra of several complex perchlorates have been obtained. These spectra indicate covalent character on the part of the coordinated perchlorate group. (Author)

Quarterly progress rept. no. 7, 15 Jul-15 Oct 64,
30 Oct 64, 24p Dynatech-506
Contract AF33 657 10797

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. See also AD-603 338.

Descriptors: (*Oxygen, Separation), (*Nitrogen, Separation), (*Cobalt compounds, Oxides), (*Palladium, Catalysis), Catalysts, Porous materials, Preparation, Particle size, Chemical precipitation, Beryllium compounds, Aluminum compounds, Coatings.

The primary objective of the program is the development of reactant particles suitable for application in a high temperature O2-N2 separator device. A series of approaches were followed to manufacture reactant particles with the desired properties. One of the most promising methods consisted of preparing the cobalt oxide raw material by decomposing and calcining cobalt oxalate. By proper control of the oxalate precipitation conditions, it was possible to control the cobalt oxalate crystal size. Upon decomposition, the resulting oxide particle size is related to the particle size of the 'mother crystals.' The testing of the reactant particles obtained up to date has continued on schedule. Five Rotary Disc Separator Tests were performed and are reported. In these tests, the performance of pure CoO, supported CoO, and supported Pd particles were measured. (Author)

AD-607 770 Div. 4, 25
OTS Prices: HC $2.00/MF $0.50

Duke Univ., Durham, N. C.
ANISOTROPY OF THE CHEMICAL SHIFT OF TRAPPED CHF3 AND NF3.
Technical rept. no. 4,
by A. Brooks Harris, Earle Hunt and Horst Meyer.
10 Oct 64, 50p
Contract Nonr1181 12

Unclassified report

Descriptors: (*Nitrogen compounds, Fluorides), (*Fluorides, Anisotropy), (*Halogenated hydrocarbons, Anisotropy), Complex compounds, Crystal lattices, Protons, Nuclear magnetic resonance, Line spectrum, Chemical bonds, Nuclear spins.

A study was made of the F19 chemical shift anisotropy in NF3 and CHF3 trapped in beta-quinol clathrates. The nuclear magnetic resonance was observed at several frequencies with the magnetic field applied at various angles relative to the crystal axis. The orientation of the molecules in the cavity and the dipolar broadening due to the lattice protons could be estimated rather closely by a qualitative analysis of the line shapes. The principal components of the chemical shift tensor of NF3 could be determined from the observed variation of the first and second moments of the line with the strength and orientation of the magnetic field. This determination was further substantiated by the good agreement between the calculated and observed line shapes for various values of the magnetic field. For CHF3, where the chemical shift anisotropy is smaller, only a cruder analysis was practicable. The sign and order of magnitude of the chemical shift anisotropy are discussed and can be understood on the basis of current ideas about the relationship between the bond characters and the chemical shift anisotropy. (Author)

AD-607 792 Div. 4, 17, 25
OTS Prices: HC $2.00/MF $0.50

Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XVII. THERMODYNAMIC STUDY OF TIN SELENIDE AND TIN TELLURIDE USING A MASS SPECTROMETER,
by R. Colin and J. Drowart. Sep 64, 30p
Contract AF61 052 225, Proj. 7350, Task 735001
WADD TR60 782 P17

Unclassified report

Descriptors: (*Vaporization, Materials), (*Selenium alloys, Vaporization), (*Tellurium alloys, Vaporization), (*Tin alloys, Vaporization), (*Mass spectroscopy, Vaporization), Enthalpy, Dissociation, Sublimation, High-temperature research, Intermetallic compounds, Tin compounds, Selenium compounds, Telleurium compounds.

In a mass spectrometric investigation of the vapor in equilibrium with solid SnSe and solid SnTe, a number of reaction enthalpies were measured and from known thermochemical data, the following thermochemical values were calculated: enathapy of formation at 298 degrees of SnSe and SnTe; dissociation energy of SnSe and SnTe; enthalpy of dimerization at 298 degrees of SnSe, SnTe, and SnTe2. The dissociation energies were compared to the available spectroscopic data.

AD-607 835 Div. 4, 30
OTS Prices: HC $1.00/MF $0.50

Princeton Univ., N. J.
DIFFERENTIAL THERMOMETRIC TITRATIONS AND THE DETERMINATION OF HEATS OF REACTION,
by Bruce C. Tyson, Jr., W. H. McCurdy, Jr., and C. E. Bricker. May 61, 23p
Contract AF49 638 467
AFOSR 762; PB 171 950

Unclassified report

Descriptors: (*Titration, Thermistors), (*Heat of reaction, Titration), Silver compounds, Nitrates, Ammonia, Pyridines, Ethylenediamine, Amines, Alcohols, Butanols, Propanols, Sodium compounds, Hydroxides, Test methods.

In the differential apparatus designed for this work, temperature-sensing devices were placed in both the sample and blank solutions. Sensitivity greater than that previously reported for thermometric titrations has been obtained and extraneous heat effects, such as stirring and heats of dilution, have been greatly minimized. This apparatus has been used to follow fourteen different reactions and the heat of the reaction has been calculated for eleven of these reactions.

AD-607 837 Div. 4, 14
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
MATERIALS AND STRUCTURES. MATERIALS AND PROCESSES ANALYSIS PROGRAM, ELECTROCHEMISTRY OF SOLIDS.
Semiannual technical rept. for 1 Jan-30 Jun 62,
by T. S. Lee and F. M. Wachi. 12 Sep 62, 30p
TDR-69(2240-53)TR-2
Contract AF04 695 69
DCAS TDR62 176

Unclassified report

Descriptors: (*Electrodes, Chemical reactions), (*Electrochemistry, Salts), (*Salts, Electrochemistry), Electrolytes, Silver, Mercury, Copper, Thallium, Ions, Oxygen, Water, Reduction (Chemistry), Iodine, Oxidation, Cathodes (Electrolytic cells), Chemical analysis, Electrodeposition.

This paper was prepared for presentation at the Tenth Annual, and First International, Meeting of the Western Section of the Operations Research Society of America in Honolulu, Hawaii, Sep 64.

Descriptors: (*Command and control systems, Operations research), (*Operations research, Command and control systems), Military requirements, Communication systems, Control systems, Design.

The 'broad systems' and 'bits and pieces' approaches to handling the development of improved command and control systems were examined and found to be unsatisfactory. An alternative approach was suggested which involves the active participation of the user command in the evolution of its own command and control system with a group of military hardware and software experts who have acquired extensive experience developing command and control systems, and who are convinced of the necessity for the user command to actively participate in the evolution and development of its own command and control system. (Author)

AD-607 987 Div. 5, 7, 8
OTS Prices: HC $3.00/MF $0.75

Aerospace Technology Div., Library of Congress, Washington, D. C.
COMMUNICATIONS NETWORKS. PT. II. DESIGNATIONS AND ABBREVIATIONS.
Rept. no. 4.
28 Oct 64, 67p
ATD P64 58; TT 64 71659

Unclassified report

Rept. on Surveys of Soviet-Bloc Scientific and Technical Literature. See also TT-64-13297.

Descriptors: (*Communication equipment, USSR), Networks.

Transliterated designations and names are given for Soviet communication equipment designations. The designations are listed alphabetically according to the Russian alphabet. A brief description is given of the equipment under each entry.

5. Communications

AD-607 586 Div. 5, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Lab., Los Angeles, Calif.
SATELLITE NETWORKS FOR CONTINUAL GLOBAL COVERAGE,
by R. David Luders. 20 May 60, 32p
STL/TR-60-0000-00126

Unclassified report

Descriptors: (*Satellite networks, Global communication systems), (*Global communication systems, Satellite networks), Communication satellites (Active), Circular orbit trajectories, Inclined orbit trajectories, Optimization, Polar orbit trajectories, Effectiveness.

Solutions are obtained to the problem of providing continual surveillance of latitudinally bounded zones of the globe by means of a particular family of satellite networks. Each network considered consists of satellites equally divided among and uniformly distributed around circular orbits of common altitude; the orbit planes are equally inclined with respect to the equator and are uniformly arranged about the polar axis. It is shown that by properly choosing the number and inclination of the orbit planes, the required coverage may be obtained; furthermore, a rational procedure is presented for minimizing the total number of satellites required at a given altitude. Results obtained by this optimization technique are displayed graphically for several representative cases of coverage requirements. (Author)

AD-607 685 Div. 5, 2
OTS Prices: HC $7.00/MF $2.00

Michigan Technological Univ., Houghton, Mich.
ANALYSIS OF IONOSPHERIC DRIFTS UTILIZING DATA OBTAINED WITH CLOSELY SPACED RECEIVERS.
Final rept.,
by Donald G. Yerg. Jun 64, 400p
Contract AF19 604 8337, Proj. 8605, Task 860502
AFCRL 64 595

Unclassified report

Descriptors: (*Ionospheric propagation, Analysis), (*Ionospheric disturbances, Analysis), Radio signals, Drift, Periodic variations, Harmonic analysis, Vector analysis, Atmospheric motion, Turbulence, Hydrostatics, Hydrodynamics, Barometric pressure, Gas ionization, Electron density, Electric fields, Electric discharges, Radio receivers.

Data obtained at 2.33 mc/s and 4.57 mc/s with closely spaced receivers at Mayaguez, Puerto Rico were made available for analysis. The method of derivatives was employed to obtain the average drift velocity vector, the average component of the drift velocity normal to the lines of constant signal intensity, the axial ratio and orientation angle of the pattern ellipse, the root-mean-square departure velocity, the turbulence ratio, the relative period of signal fading. Daily and seasonal studies are presented for each of these parameters. A kinematic study and the observational data support a postulate that the ionospheric irregularities are associated with the development of electric fields and subsequent discharge processes. (Author)

AD-607 797 Div. 5, 8
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
CONVERSION AND RECONVERSION OF FREQUENCY-DIVISION MULTIPLEXED SIGNALS TO PULSE-CODED SIGNALS,
by M. Pickover. Aug 64, 22p
Task 1E6 34301 D244 07 04
USAEL TR2488

Unclassified report

Descriptors: (*Analog-to-digital converters, Speech transmission), (*Digital-to-analog converters, Speech transmission), (*Speech transmission, Analog-to-digital converters), Data transmission systems, Digital systems, Telephone communication systems, Coding, Decoding, Signal-to-noise ratio, Transmission lines.

The conversion of a frequency-division multiplexed (FDM) signal to pulse-code modulation (PCM) signal and the reconversion to its original FDM signal has been accomplished. Some of the theoretical considerations and actual results are discussed and tabulated. An application of a complete system and its advantages are presented. (Author)

AD-607 847 Div. 5, 8
OTS Prices: HC $1.00/MF $0.50

Ohio State Univ., Columbus. Research Foundation.
THE INTELLIGIBILITY OF TWICE DETERIORATED SPEECH,
Technical note no. 101,
by John W. Black and Joseph G. Agnello. Sep 64,
15p OSURF-1002
Contract Nonr495 18, Proj. NR145 993

Unclassified report

Prepared in cooperation with Temple Univ., Philadelphia, Pa.

Descriptors: (*Communication systems, Speech recognition), (*Speech recognition, Intelligibility), (*Intelligibility, Speech recognition), Signals, Signal-to-noise ratio, Distortion, Acoustics, Hearing, Least squares method.

Four aspects of distorted and controlled speech signals were tested with respect to the intelligibility of the signals: signal level, signal-to-noise ratio, the absence of acoustically weak segments, and periodic interruptions. Each distortion was represented in six degrees. From a mean intelligibility score of each condition, values of intelligibility were predicted for doubly distorted speech under assumptions that the distortions were non-overlapping and that a pair of distortions should produce the joint effect of the two singly. Thus, the predictions were made by multiplying the values associated with individual distortions. The results were in keeping with the assumption that the intelligibility of an imperfect communication system can be estimated if the relative effects of individual deterrents to intelligibility in the system are known. Although the assumption of joint probability is tenable as a first approximation, the error is more frequently in the direction of an over-estimation of the intelligibility of the signal rather than an under-estimation. (Author)

AD-607 938 Div. 5, 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME THOUGHTS ON DEVELOPING FUTURE COMMAND AND CONTROL SYSTEMS,
by S. M. Genensky and A. E. Wessel. Oct 64, 23p
P-2941-1

Unclassified report

7. Electrical Equipment

AD-607 425 Div. 7
OTS Prices: HC $5.00/MF $1.00

Army Electronics Labs., Fort Monmouth, N. J.
PROCEEDINGS, ANNUAL POWER SOURCES CONFERENCE (14th), 17-19 MAY 1960.
19 May 60, 162p
Unclassified report

This conference was formerly called The Battery Research and Development Conference.
Legibility of this document is in part unsatisfactory.
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Descriptors: (*Batteries and Components, Symposia), (*Power supplies, Symposia), (*Electric power production, Symposia), Energy conversion, Solar radiation, Thermal radiation, Fuel cells, Storage batteries, Primary cells, Electrochemistry, Reviews.

Contents:
Thermal Energy Conversion
Solar Energy Conversion
Fuel Cell Batteries
Secondary Batteries
Comparison Of Energy Conversion Systems
Energy Storage Devices
High Rate Batteries
Primary Batteries

AD-607 528 Div. 7, 8
OTS Prices: HC $5.00/MF $1.00

Thermo Electron Engineering Corp., Waltham, Mass.
EFFECT OF ELECTRODE CONFIGURATION ON THERMIONIC CONVERTER OUTPUT CHARACTERISTICS.
Annual technical summary rept. no. 3, Mar 63-Mar 64,
by A. Shavit and S. S. Kirtrilakis. Mar 64, 153p
TE7-65
Contract AF19 604 8453, Proj. 6694, Task 669409
AFCRL 64 721
Unclassified report

Descriptors: (*Thermionic converters, Electrodes), Energy conversion, Plasma medium, Cesium, Ions, Vapor pressure, Rhenium, Molybdenum, Electrical properties, Diodes, Work functions, Test equipment.

The work function of a large planar polycrystalline rhenium emitter in the presence of cesium vapor was determined through measurements of the lower mode saturation current. The range of measurement of emitter temperatures was 700K to 2100K and of cesium vapor pressures, 0.0002 to 2 mm Hg. The experimental results were extrapolated ty another order of magnitude to cesium pressures up to 30 mm Hg to cover the whole range of operations of a thermionic converter. A map showing all the thermionic properties of a rhenium emitter was prepared. In addition, the work function of a polycrystalline molybdenum collector, in the presence of cesium vapor, was determined experimentally through both emission and collection processes. Based on the data obtained, the performance of the thermionic converter was correlated in terms of the deviation of the actual performance from the 'ideal' performance. Particular attention was focused on the current deficiency under ion-rich conditions. A detailed description of the test vehicle is given. (Author)

AD-607 544 Div. 7
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
INVESTIGATION OF THE HYDROGEN-OXYGEN FUEL CELL II,
by Walter G. Taschek and Herbert F. Hunger.
Jul 64, 48p
Task 1G6 22001A053 04
USAEL TR2491
Unclassified report

See also PB-147 388.

Descriptors: (*Fuel cells, Electrodes), (*Electrodes, Fuel cells), Hydrogen, Oxygen, Air, Electrolytes, Acids, Electrical properties, Carbon, Performance (Engineering), Life expectancy, Polarization, Energy conversion, Halocarbon plastics, Waxes, Moistureproofing, Catalysis, Surface area, Preparation.

This report is intended to advance the general knowledge of fuel cells and to provide information concerning high drain hydrogen and oxygen (air) electrodes for use in acid electrolytes. The information offered as a result of this investigation includes the various preparation steps and sequence of steps involved in preparing electrodes with high current carrying ability, the characterization of the carbon carrier material used, and the results of performance and life tests. Theoretical considerations concerning the polarization behavior of oxygen electrodes and the position of the reaction zone within the electrode structure are offered. (Author)

AD-607 651 Div. 7, 12
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
DESIGN FEATURES OF RACK AND PANEL CONNECTORS FOR THE MARK 3 RE-ENTRY VEHICLE INSTRUMENTATION SHELF.
Technical information series,
by C. E. McOsker. 31 Jan 61, 48p R61SD16
Unclassified report

Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Electric connectors, Instrument panels), (*Instrument panels, Reentry vehicles), Control panels, Design, Environmental tests, Beryllium alloys, Copper alloys, Instrumentation, Performance (Engineering), Electrical properties.

This report summarizes the results of tests performed on a modified design of standard rack and panel multiple-contact connectors with removeable contacts for their use in the Mark 3 re-entry vehicle instrumentation shelf. New connectors made to the modified design have been subjected to the required tests in applicable paragraphs of MIL C 5015, Mark 3 component specification NCS 1692, and specific design engineering instructions. The connectors successfully complied with the environmental qualification test requirements of these specifications. (Author)

AD-607 704 Div. 7, 24
OTS Prices: HC $2.00/MF $0.50

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
PHOTOGRAPHIC RECONNAISSANCE TERRAIN ILLUMINANTS.
Interim engineering rept.,
by P. Bruce Newell and A. B. White. 30 Sep 64, 48p
EGG B-2904
Contract AF33 657 11327, Proj. 6220, Task 622005
Unclassified report

See also AD-601 854.

6. Detection

AD-607 599 Div. 6, 10, 24
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
RADIANCE OF ROCKET ENGINE FLAMES AT LOW ATMOSPHERIC DENSITY,
by George O. Abell. 1 Nov 58, 38p
STL/GM-TN-0165-00199
Unclassified report

Prepared in cooperation with California Univ., Los Angeles.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Guided missiles, Tracking), (*Rocket motors, Exhaust flames), (*Exhaust flames, Brightness), Low-pressure research, Photographic analysis, Ballistic cameras, Photographic analysis, Photographic images.

Photometry was performed on 71 photographs of a model engine flame fired under simulated high-altitude conditions in a low pressure chamber to determine the flame brightness. The photographs were obtained in three colors covering the spectral range from 3600 to 8600, and at ambient pressures of 3-, 30-, 160-, and 760-mm of Hg. The surface brightness of the flame alternates by a factor of nearly 10,000 as the ambient pressure is lowered from sea level to 3 mm of Hg. On the other hand, the flame dimensions dilate by a factor of 10, so the total energy radiated by the flame drops only a factor of 100 over the pressure range covered. A discussion is given of the factors affecting the relative exposure of the flame under various conditions on the photographic emulsion in a ballistic camera. It is shown that at the ranges of interest, the flame will usually image either as a line or point. (Author)

AD-607 788 Div. 6, 8, 20
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
DETECTION OF THE ELECTROMAGNETIC RADIATION FROM NUCLEAR EXPLOSIONS IN SPACE,
by W. J. Karzas and Richard Latter. Oct 64. 44p
RM-4306 Unclassified report

Descriptors: (*Nuclear explosions, Detection), (*Electromagnetic waves, Nuclear explosions), Upper atmosphere, Terrestrial magnetism, Electric currents, Space weapons, Mathematical analysis.

The electromagnetic signal generated by interaction of nuclear-explosion-induced electric currents with the geomagnetic field can serve as a basis for detecting such explosions at extreme distances from the earth. In the present paper, an earlier theory of this phenomenon developed by the authors is extended to allow estimates of the maximum detection range. It is concluded that this electromagnetic signal may be detectable at distances of the order of 10 to the 7th power times the square root of Y sub KT kilometers from a nuclear explosion of total yield Y sub KT kilotons. (Author)

AD-607 882 Div. 6, 12, 15
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
TRACKING WITH POOR NOMINAL CONDITIONS,
by D. Morrison. 18 May 59, 3p STL/PA-2027-01/6
Unclassified report

Descriptors: (*Tracking, Spacecraft), (*Iterative methods, Tracking), Matrix algebra, Functions, Iterative methods, Equations.

Tracking of spacecraft, when a good set of nominal conditions is not available, is described by using iterative methods.

AD-607 892 Div. 6, 8
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
A NEW TYPE OF DOPPLER SIMULATOR,
by John L. Kerr. Jun 64, 26p
Task 1G6 20901A040 01
USAEL TR2493
Unclassified report

Descriptors: (*Doppler effects, Simulators), Doppler radar, Microwave networks, Phase shifters, Waveguides, Moving target indicators, Simulation, Radar targets.

The design of a new type of doppler simulator, fabricated at USAEL, is based on a rectangular waveguide in the form of a closed E-plane circular loop fed by a 90-degree H-plane corner. The waveguide loop is divided symmetrically in the plane of the loop. The two sections are so arranged that one, the rotor, may be continuously rotated while the other, the stator, which contains the input waveguide, remains fixed. The simulator produces a highspeed linear phase shift with relatively low mechanical rotational speed. Target direction, approaching or receding, can be simulated by choosing the appropriate direction of rotation. The device is useful in a laboratory bench setup as well as for field operation. (Author)

AD-607 946 Div. 6
OTS Prices: HC $3.00/MF $0.75

Lamont Geological Observatory, Palisades, N. Y.
RESEARCH DIRECTED TOWARD THE USE OF LONG AND INTERMEDIATE PERIOD SEISMIC WAVES FOR THE IDENTIFICATION OF SEISMIC SOURCES.
Final rept. for Aug 60-Jul 64,
by L. E. Alsop. 31 Jul 64, 64p
Contract AF19 604 7376, Proj. 8652, ARPA Order292, Task 865203
AFCRL 64 835
Unclassified report

Descriptors: (*Seismic waves, Identification), (*Nuclear explosions, Detection), (*Detection, Underground expolsions), Seismographs, Sources, Fourier analysis, Data processing systems, Digital computers, Seismology, Data, Mapping, Velocity, Spectrographic analysis.

Of particular interest to the needs of Project VELA-UNIFORM are the following: a study of the radiation patterns of surface waves from underground nuclear explosions and small magnitude earthquakes, wherein it was determined that the radiation patterns from explosions in tuff and alluvium, but not in granite, could be interpreted as arising from an explosive force acting as a step function in time; a study of the relative excitation of surface waves by earthquakes and underground explosions, which yielded the result that most but not all of the earthquakes studied generated surface waves 5 to 10 times greater than the maximum observed for explosions of the same Richter magnitude; an almost complete summary of Rayleigh wave phase and group velocities for various regions of the world; a program of epicenter relocation carried out so far for the South Pacific Ocean, the Arctic north of 60 degrees N, the Gulf of Aden, Red Sea, and Arabian Sea, the African Rift Zone, and the Central Indian Ocean, which showed that in these places at least large earthquakes are confined to much smaller regions than previously thought; successful utilization of displacement transducers with long period seismometers. (Author)

passive mode at relatively low cesium pressure were in qualitative agreement with theory, the actual current densities obtained were not high enough to produce practical power densities at high output voltage. The method of emitter fabrication which used a niobium braze material appears to be a primary reason for the low performance.

AD-607 968 Div. 7
OTS Prices: HC $2.00/MF $0.50

Lockheed Missiles and Space Co., Palo Alto, Calif.
LITHIUM-SILVER CHLORIDE SECONDARY BATTERY INVESTIGATION.
Quarterly technical progress rept. no. 3,
by J. E. Chilton, Jr. and R. W. Holsinger. 14 Oct 64,
30p
Contract AF33 615 1195, Proj. 8173, Task 817304 10
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

See also AD-499 399.

Descriptors: (*Batteries and components, Storage batteries), (*Storage batteries, Electrodes), (*Electrodes, Storage batteries), Lithium, Silver compounds, Chlorides, Electrolytes, Voltage, Electric currents, Life expectancy, Aluminum compounds, Nickel compounds, Polarization, Radiation damage, Electrochemistry, Electrodeposition, Resistance (Electrical), Design, Aerospace craft.

Aluminum cased cells were tested for leaks, with a Helium leak detector, before filling. Hull cell experiments showed best lithium deposition 10 to 4 ma per square cm for lithium chloroaluminate solutions. Silver chloride solubility was 10 to the 10th power times more insoluble in propylene carbonate than in water. Heat of reaction for lithium-silver chloride was found to be 67.5± 1 K cal/mole. Lithium-silver chloride cell cycle life was improved at high temperature. The nickel chloride utilization (initial discharge) in a lithium-nickel chloride cell was found to be 20% for a voltage end point of 1.88 volts. (Author)

Descriptors: (*Illumination, Photographic reconnaissance), (*Xenon lamps, Design), (*Reflectors, Xenon lamps), Electric arcs, Electrodes, Heat transfer, Cooling, Cathodes, Materials, Soldered joints, Luminescence, Night photography, Aerial photography, Lighting equipment.

This investigatory work was directed toward the achievement of liquid-cooled tubular xenon sources suitable for use as continuous (d-c) sources for night terrain illumination. The most useful lamp-reflector design for night aerial strip photography should produce a rectangular beam of light whose intensity is contoured over its cross section in such a way as to produce uniform exposure over the extremes of the film plate. It is shown that by introducing a cylindrical parabolic reflector with a line source mounted at its focus, light can easily be directed into a rectangular beam. Work was done on the design of a water-cooled 7-mm bore, 3-in. arc length lamp. Investigation was also made into the material and configuration for suitable electrodes, low RFI starting methods, spectral measurement of the output of such a lamp, and the design and fabrication of a tailored beam reflector.

AD-607 707 Div. 7, 26
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
A MATHEMATICAL MODEL FOR A DRY POWDERED MAGNETIC CLUTCH.
Final rept.,
by E. P. Blackburn. Jul 60, 86p STL/TR-60-0000-09149
Contract AF04 647 309

Unclassified report

Descriptors: (*Clutches, Mathematical models), (*Mathematical models, Clutches), Operation, Torque, Equations, Synchros, Iron, Powder metals, Simulation, Feedback, Control systems.

A mathematical model was developed for a magnetic clutch. The clutch is an electromechanical device designed to transmit a torque which can be modulated with an electric current. Torque is transmitted through a dry, ferrous powder located between the input and output members. The action of this powder is controlled by a magnetic field. Clutches of this type are produced commercially by Lear, Inc. A physical explanation of the torque-producing mechanism was given, and the output torque was defined in terms of the total flux passing through the powder. The flux produced by a signal current to the clutch is affected by eddy currents, hysteresis and by the the non-constant permeability of the ferrous powder. The eddy current effect can be described by the diffusion equation, and the hysteresis effect by a describing function. The non-constant permeability of the powder is essentially a dynamic effect and is evaluated from the experimental data. Experimental data was given for the clutch, and the correlation between the analytical model and this data was shown. (Author)

AD-607 784 Div. 7, 8, 30
OTS Prices: HC $2.00/MF $0.50

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON NEW CONCEPTS IN ENERGY CONVERSION.
Quarterly technical progress rept. no. 4, 1 Jun-31 Aug 64,
by W. D. Jackson, G. A. Brown, J. L. Kerrebrock, and E. N. Carabateas. 15 Sep 64, 31p
Contract AF33 615 1083, Proj. 8173, Task 817306

Unclassified report

See also AD-603 235.

Descriptors: (*Energy conversion, Magnetohydrodynamics), (*Magnetohydrodynamics, Power supplies), (*Thermionic converters, Materials), Generators, Liquid metals, Electrical conductance, Alkali metals, Vaporization, Cesium, Transport properties, Metal films, Ions, Penetration, Tungsten, Single crystals, Thermionic emission.

Research progress in the following areas is reported: (1) magnetohydrodynamic power generation with liquid metals, (2) liquid-metal magnetohydrodynamic generators, (3) alkali-metal magnetohydrodynamic generators, and (4) thermionic energy conversion.

AD-607 844 Div. 7, 25
OTS Prices: HC $3.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
ON DEVELOPING AND APPLYING A HALL GENERATOR EQUIVALENT CIRCUIT.
Bachelor's thesis,
by Clarence Zicko. 25 May 59, 82p T-226
Contract AF04 647 303

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Hall effect, Generators), (*Generators, Hall effect), Models (Simulations), Circuits, Electrons, Quantum mechanics, Semiconductors, Magnetic fields, Electric fields, Amplifiers, Equations.

The purpose of the thesis was to develop a Hall generator equivalent circuit. This circuit is based upon theoretical expressions governing the device. How well the model describes the device was revealed by comparing theoretical calculations and experimental results. Although only qualitative comparisons are made, the results show that the model does describe the device. The model accounts for magneto-resistive effects and Hall terminal loading. (Author)

AD-607 864 Div. 7
OTS Prices: HC $4.00/MF $0.75

Allison Div., General Motors Corp., Indianapolis, Ind.
HIGH VOLTAGE THERMIONIC CONVERTERS.
Final rept. for 1 Mar-31 Aug 64,
by D. L. Dresser. Oct 64, 1 2p EDR-3999
Contract AF33 615 1533
Proj. 8173, Task 817305
APL TDR64 120

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Thermionic converters, Performance (Engineering)), Design, Geometry, Materials, Molybdenum, Tantalum, Tungsten, Rhenium, Manufacturing methods, Electric currents, Voltage, Ionic current, Thermal radiation, Data, Graphics.

Several emitter materials, tantalum, tungsten and rhenium, and two emitter geometries, planar and excess area were evaluated in a flexible laboratory thermionic converter design. Results are reported from six converters that were tested for a total of 1070 hr. Experimental results from the excess area emitter converters did not exhibit the current enhancement observed in multicapillary and slotted emitter converters developed on a previous Air Force contract. While the electron currents in the

AD-607 428 Div. 8
OTS Prices: HC $2.00/MF $0.50

Raytheon Co., Burlington, Mass.
X-BAND ELECTROMAGNETIC AMPLIFYING LENS.
Rept. for 25 Nov 63-25 Feb 64,
by J. Skowron and N. Heenan. Aug 64, 42p
Contract AF30 602 2892, Proj. 5573, Task 557305
RADC TDR64 249

Unclassified report

Descriptors: (*Amplifiers, X-band), (*Oscillators, Millimeter waves), (*Millimeter waves, Amplifiers), Design, Cathodes (Electron tubes), Dielectrics, Brillouin zones, Electron tube parts, Tests, Electric arcs.

This report covers the work to build and evaluate an experimental Electromagnetic Amplifying Lens (EAL) at X-band which will demonstrate the practicality of the EAL principle, and to carry out a theoretical and experimental investigation of fabrication techniques and tube components necessary for the embodiment of the EAL principle in a practical super power millimeter wave oscillator or amplifier. During the quarter, a decision was reached to incorporate into the EAL a new cathode which would provide an accurate cathode-anode spacing. Design work proceeded toward this end and was largely complete by the end of January. Simultaneously, tests were conducted on the EALat 5250 - 5650 Mcs to determine the effects of driving the tube at these frequencies. A post-operative analysis of the disassembled EAL indicated that severe arcing and melting of copper had occurred within the tube. There was, therefore, additional difficulty imposed upon the analysis of previous results. The cathode redesign was modified to eliminate arcing problems if possible. (Author)

AD-607 429 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
ELECTRON CONDUCTION PROPERTIES OF THIN FILMS OF MUSCOVITE MICA.
Semiannual rept. for 1 Jul-31 Dec 63,
by Malcolm McColl. 18 Sep 64, 49p
TDR-269(4250-12)-1
Contract AF04 695 269
SSD TDR64 93

Unclassified report

Descriptors: (*Dielectric films, Mica), (*Electrons, Dielectric films), (*Thermionic emission, Electrons), Dielectrics, Temperature, Potential theory, Models (Simulations), Secondary emission, Solid state physics.

Identification of the conduction mechanism through thin dielectric films as being Schottky emission of electrons from the cathode surface into polaron states in the conduction band of the insulator was attempted. Voltage-current characteristics through a vacuum cleaved crystalline muscovite mica film 1400A thick, sandwiched between evaporated metal electrodes, were made over a temperature range of 22 to 150C, which was the limit of the experimental apparatus. The results are discused and related in detail to previous relevant experimental work. The data suggest that a voltage-current characteristic at 200C could provide a check on the entire Schottky emission model.(Author)

AD-607 436 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Micro State Electronics Corp., Murray Hill, N. J.
WIDE BAND, LOW NOISE, ALL SOLID STATE ELECTRONICALLY TUNABLE UHF AMPLIFIER.
Final rept. for Mar 63-Feb 64.
Sep 64, 32p
Contract AF30 602 2967, Proj. 5573, Task 557301
RADC TDR64 305

Unclassified report

Descriptors: (*Microwave amplifiers, Semiconductor devices), (*Semiconductor devices, Microwave amplifiers), Broadband, Preamplifiers, Tuned amplifiers, Noise (Radio), Tunnel diodes, Transistors, Tuning devices, Filters (Electromagnetic wave), Varactor diodes, Resonators, Yttrium, Iron, Garnet, Ultrahigh frequency.

The purpose of the program covered by this report was to develop an all solid state, electronically tunable, low noise amplifier covering the frequency range 300 to 1000 cps. The equipment described includes wideband tunnel diode and transistor amplifiers, and two types of electronically tunable filters - one employing magnetic tuning of an yttrium iron garnet resonator, and the other voltage tuning of a variable capacitance diode. (Author)

AD-607 437 Div. 8, 5
OTS Prices: HC $3.00/MF $0.75

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME VII. ADAPTIVE ERROR CONTROL SYSTEMS.
Final rept. vol 7,
by F. P. Corr and A. H. Frey, Jr. Jul 64, 86p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V7

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Errors, Communication theory), (*Coding, Adaptive communication systems), Control systems, Design, Digital systems, Simulation, Data transmission systems, Optimization, Computer logic, Communication systems.

The principal conclusions drawn from this study are: (1) The design of a system, on a full-duplex link, capable of adapting block length can be achieved at moderate cost. (2) On the HF links tested the gains with this system were meager. It is anticipated, although not proven, that performance will be better on land lines. (3) For combating Rayleigh fading variable block length has more potential than single error correction with fixed block length; however, if feasible, variable bit rate offers still more in terms of average and low percentile efficiency. (Author)

AD-607 438 Div. 8, 5
OTS Prices: HC $2.00/MF $0.50

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME VIII. EXPERIMENTAL VERIFICATION AND OTHER STUDIES.
Final rept. vol. 8,
by F. P. Corr and A. H. Frey, Jr. Jul 64, 37p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V8

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Errors, Communication theory), (*Coding, Adaptive communication systems), Control systems, Performance (Engineering), Experimental data, Data transmission systems, Communication systems, Design, Optimization, Polynomials.

8. Electronics and Electronic Equipment

AD-607 419 Div. 8, 13
OTS Prices: HC $7.00/MF $1.75

Sylvania Electric Products, Inc., Waltham, Mass.
HARDENED ANTENNA STUDIES. ELECTRICAL INVESTIGATION OF HARDENED HF ANTENNAS.
Final rept. for 15 Mar 63-15 Mar 64,
by E. Stephaniac, J. Snitkoff, H. Zeltzer, W. Underhill, and T. Ng. Sep 64, 385p SEP-F607-1
Contract AF30 602 2932, Proj. 4519, Task 451906
RADC TDR64 184 V1A

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Antennas, Performance (Engineering), Slot antennas, Spiral antennas, Underground antennas, Antenna configurations, Antenna radiation patterns, Shelters, Nuclear explosion damage, Medium frequency, High frequency, Very high frequency, Ultrahigh frequency, Design,Economics, Model tests.

This engineering study has resulted in the generation of efficient antenna techniques consistent with the capabilities to withstand the effects of nuclear weapons. The HF antenna techniques considered in this study are useful throughout the 2-30 mc frequency band; the UHF antennas operate in the 225-400 mc region. The program was divided into two phases. Phase I was a theoretical study of antenna techniques which were investigated with regard to feasibility, configuration required, bandwidth possibilities, efficiency, radiation patterns, hardness ratings, debris effects, and economic analysis. Phase II involved the fabrication and test of electrical models of the most promising designs. This phase resulted in design data, cost and hardness estimates for antennas for the HF and UHF bands. (Author)

AD-607 421 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Cornell-Dubilier Electronics Div., Federal Pacific Electric Co., Norwood, Mass.
PRODUCTION ENGINEERING MEASURE FOR THE PRODUCTION OF SILICON MONOXIDE CAPACITORS MICROELEMENT.
Quarterly rept. no. 5, 31 May-31 Aug 64,
by J. J. O'Connor. 31 Aug 64, 27p
Contract DA36 039AMC01478E

Unclassified report

See also AD-603 080.

Descriptors: (*Capacitors, Manufacturing methods), (*Silicon compounds, Capacitors), Monoxides, Microminiaturization (Electronics), Heat treatment, Electrodes, Dielectric films, Production.

Deposition masks were completed and used to fabricate all the required types of SiO capacitor microelements. The masks appear to be of correct dimensions. Commercially glazed and metallized substrates were tested and found satisfactory except for a thickness variation of 0.003 inch over specifications. Microelements fabricated on these substrates occasionally yielded capacitors with very low dissipation factors (0.1 -0.5%) directly from the deposition cycle; most elements however, had DF values near 4%. Apost-fabrication heat treatment is used to bring the DFbelow 1.5%. Minor, but important modifications were made in the equipment, and the thinfilm monitor and microcircuit jig are operating satisfactorily. (Author)

AD-607 423 Div. 8
OTS Prices: HC $1.00/MF $0.50

Illinois Univ., Urbana. Engineering Experiment Station.
BALANCED BACKFIRE ZIGZAG ANTENNAS.
Technical rept. no. 82,
by Paul E. Mayes. Oct 64, 19p
Contract AF33 657 10474, Proj. 6278, Task 627801

Unclassified report

Descriptors: (*Log periodic antennas, Theory), Antenna configurations, Antenna radiation patterns, Antenna feeds, Polarization, Design, Performance (Engineering), Bandwidth, Ultrahigh frequency.

Linearly polarized backfire antennas are described which have high front-to-back ratio and very low sidelobes. The backfire radiation is produced from a meandering conductor. The principal directional characteristics can be determined by using linear array theory. When the conductor is periodic this can be related to a series expansion of the fields in space harmonics. The radiation properties of periodic backfire zigzags are compared to the end-fire type previously reported. Bandwidth limitations on the backfire periodic zigzags are readily extended by tapering the structure to produce a log-periodic antenna. Measured patterns and impedance of several log-periodic zigzag antennas illustrate how the performance is related to that of the periodic structures. (Author)

AD-607 426 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Westinghouse Defense and Space Center, Baltimore, Md.
FAILURE MECHANISMS IN MICROELECTRONICS.
Final rept.
Aug 64, 100p WDSC-385A4
Contract AF30 602 3017, Proj. 5519, Task 551906
RADC TDR64 252

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Microminiaturization (Electronics), Failure (Mechanics)), (*Failure (Mechanics), Microminiaturization (Electronics)), Diodes (*Semiconductor), Disks, Transistor amplifiers, Silicon compounds, Oxides, Surface properties, Electrical properties, Chemical milling, Stresses, Electrical conductance, Electronic equipment, Reliability (Electronics), Silicon.

Investigations were performed on three types of microelectronic devices: multiple diode wafers, inversion layer diode amplifiers, and versatile linear amplifiers. Two failure mechanisms were identified and studied in detail: unsuspected diffusion barriers from photoetch procedures, and variations in passivation layer properties. The relationship to these, of current amplification (beta), or reverse voltage breakdown, of leakage, and other quantities was examined. Each step in microelectronic device fabrication was investigated for its contribution to failure mechanisms. A partially conducting region in the passivating oxide was identified and studied, 300 ±100 A from the silicon. This contributes to the leakage in microelectronic devices usually attributed entirely to channels in the silicon. (Author)

AD-607 471 Div. 8
OTS Prices: HC $3.00/MF $0.75

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
A RAPID RESPONSE DIODE SWITCH FOR LOW LEVEL SIGNALS IN THE H. F. BAND.
Technical rept. nos. 24, 8,
by Albert Marinus Schaffer. Sep 64, 74p RRL-260
Contracts Nonr1834 02, NObsr89229, Proj. NR371 161
Unclassified report

Descriptors: (*Electronic switches, Diodes (Semiconductor)), (*Diodes (Semiconductor), Electronic switches), High frequency, Radio signals, Switching circuits, Antennas, Radio beams, Electrical properties, Design, Transients, Electrical impedance, Attenuators, High-pass filters, Performance (Engineering).

Design requirements are outlined for a diode switch featuring low insertion loss and high isolation in the range 2 - 32 Mc/sec. Circuit models are presented using diodes in series, shunt, and series-shunt switching configurations. On the basis of the characteristics predicted for the models, a switch configuration is considered which could be expected to fulfill the design requirements. The measurement apparatus and technique are described and experimental results examined. Differences between measured and calculated switch characteristics are discussed and methods for improving its performance are suggested. The switch performance is superior to those which have been available previously. (Author)

AD-607 473 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Westinghouse Electric Corp., Elkridge, Md.
PRODUCTION ENGINEERING MEASURE. TRANSISTOR (WX-4001), LOGIC GATE (WM-201), FLIP-FLOP (WM-202), AC BINARY (WM-213).
Quarterly rept. no. 4, 1 Apr-30 Jun 64,
by Hauw T. Go. 30 Jun 64, 48p
Contract DA36 039AMCO3617E
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-601 676.

Descriptors: (*Transistors, Production), (*Relaxation oscillators, Production), (*Gates (Circuits), Production), Computer logic, Alternating current, Dielectric properties, Encapsulation, Bonding, Wire, Reliability (Electronics), Photochemistry, Manufacturing methods, Aluminum, Oxides, Borates, Bromides, Diffusion.

Wire-Bonding-an evaluation test performed on two different processing techniques for the elimination of plague formation at bond with the exception of the life test at 125C was completed. The available test results indicate that the all aluminum system (Al-Al-Al) performed better than the Al-Al-Au combination. An experiment was performed, whereby the dielectric strength of the oxide created by the standard boron tribromide diffusion was compated with that obtained with trimethyl borate (B(OCH3)3). A double coating and exposure technique proved to increase the temperature stress resistance of the devices in the 25C to 200C temperature range. Encapsulation studies included an evaluation program to monitor the quality of the flat packages. Reliability tests were performed utilizing computer progams.

AD-607 475 Div. 8
OTS Prices: HC $2.00/MF $0.50

Rome Air Development Center, Griffiss AFB, N.Y.
INVESTIGATION OF TUNNEL DIODE AMPLIFIERS AS A PSEUDO PASSIVE UNIT,
by Dean L. Baerwald and Anthony F. Snyder.
Sep 64, 37p
Proj. DU63 20
RADC TDR64 340
Unclassified report

Descriptors: (*Semiconductor devices, Amplifiers), (*Tunnel diodes, Amplifiers), (*Spiral amplifiers, Tunnel diodes), Integrated circuits, Gain, Bandwidth, Construction, Transmission lines, Electrical impedance.

The report covers the integration of a stripline tunnel diode reflection amplifier and spiral antenna. The characteristics of the individual amplifiers, such as gain, bandwidth, saturation limits and physical construction, are included. Theoretical and experimental characteristics of a three-element pseudo-passive array are also given. Criteria for construction of a pseudo-passive unit are developed. (Author)

AD-607 477 Div. 8, 25
OTS Prices: HC $3.00/MF $0.50

Radio Corp. of America, Moorestown, N. J.
TRANSVERSE FOCAL REGION OF A SPHERICAL REFLECTOR, PART 2: POLARIZATION.
Scientific rept. no. 1,
by Geoffrey Hyde and Roy C. Spencer. May 64, 56p
Contract AF19 628 2758, Proj. 4600, Task 460007
AFCRL 64 292 P2
Unclassified report

See also AD-603 788.

Descriptors: (*Antennas, Electromagnetic wave reflections), (*Electromagnetic wave reflections, Polarization), (*Reflectors, Antenna feeds), (*Optical properties, Reflectors), Spheres, Surface properties, Electromagnetic fields, Scattering, Wave transmission, Graphics, Equations, Optics, Reflection, Antenna configurations.

The polarization of the reflection of a uniform plane wave incident on a spherical reflector is analyzed using the current distribution method for scattered fields. It is seen that the effective current, the component radiating in the direction of the circle of least confusion, has essentially the same polarization as the specularly reflected fields. Formulas for the current distribution on the reflector and the effective current are derived in several ways. The effective current is graphed and contour plots given. Formulas for the fields reflected from the tangent plane are derived in terms of direction cosines. These formulas are discussed and contour plots of the field components are given. (Author)

AD-607 483 Div. 8, 25
OTS Prices: HC $3.00/MF $0.50

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION OF A P-INDUCED CHANNEL INSULATED-GATE FIELD-EFFECT TRANSISTOR.
Master's thesis,
by Kevin Grant Stogsdill. Aug 64, 55p
AFIT GE/EE/6419
Unclassified report

Descriptors: (*Transistors, Electronics), Semiconductor devices, Very high frequency, Amplifiers, Oscillators, Electrical properties, Equations, Bandwidth, Gain, Power, Design, Analysis.

The analysis and use of the p-induced channel insulated-gate field-effect transistor (P-ICFET) were investigated.

This volume contains the results of three investigations. The first of these, an experimental verification of the techniques used in the handbook of Volume 6 is described in Section 2. It described the gathering of error statistics, the data reduction, the selection of the optimum system and prediction of its performance, and the verification of the predicted performance. Section 3 contains a mathematical development showing the equivalence of block error rates as a function of n and the distribution of error-free intervals. In Section 4 a technique for combining error detection with message framing is described.

AD-607 439 Div. 8
OTS Prices: HC $6.00/MF $1.25

Sylvania Electric Products, Inc., Buffalo, N. Y.
ELECTRONICALLY STEERABLE ARRAY FOR SPACE VEHICLE APPLICATION.
Final rept. for 11 Apr 63-10 Apr 64,
by T. R. Schiller. Aug 64, 238p
Contract AF30 602 3041, Proj. 4506, Task 450604
RADC TDR64 222

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. See also AD-602 415.

Descriptors: (*Antennas, Microwave frequency), (*Millimeter waves, Antennas), (*Ferromagnetic materials, Antennas), Spacecraft, Scanning, Diffraction gratings, Propagation, Gain, Beams (Electromagnetic), Scattering, Impedance matching, Feasibility studies, Design, Mathematics.

The feasibility of designing and constructing a high gain, broadband, inertialess scanned antenna at millimeter frequencies (30-100 Gc) for aerospace applications was investigated. Quasi-optical ferromagnetic beam scanning was studied analytically and experimentally. The results demonstrated that a scannable millimeter antenna is feasible. Quasi-optical diffraction grating techniques, where both the spacing between grating elements and the distance (depth) between grating elements can be used to realize scanning, were studied analytically. A third technique was studied, in which a small aperture ferromagnetic scanner is used with scattering and spherical optics. The conclusions contain detailed descriptions of the antenna systems using either cubic lattice ferrites or hexagonal lattice ferrites. In addition, the technique employing ferromagnetic materials as scattering mechanism spherical optics is detailed. (Author)

AD-607 445 Div. 8
OTS Prices: HC $2.00/MF $0.50

Sylvania Electric Products, Inc., Waltham, Mass.
RESEARCH PROGRAM TO EXTEND THE THEORY OF WEIGHT DISTRIBUTION AND RELATED PROBLEMS FOR CYCLIC ERROR-CORRECTING CODES.
Summary scientific rept. no. 3,
by H. F. Mattson and E. F. Assumus, Jr. Jul 64, 50p
Contract AF19 604 8516, Proj. 5628, Task 562801
AFCRL 64 605

Unclassified report

Descriptors: (*Coding, Groups (Mathematics)), (*Groups (Mathematics), Coding), Errors, Corrections, Algebra, Number theory, Communication theory.

Minimum weight in quadratic-residue codes are discussed. The background is stated, and some results on codes over quadratic number fields are derived. Passage via the residue-class map to finite quadratic-residue codes is also discussed.

AD-607 450 Div. 8
OTS Prices: HC $3.00/MF $0.50

Microwave Lab., Stanford Univ., Calif.
MULTIMEGAWATT BROADBAND MICROWAVE TUBES.
Quarterly status rept. no. 10, 1 Feb-30 Apr 64,
by Marvin Chodorow. Sep 64, 53p
Contract AF30 602 2575, Proj. 5573, Task 557303
RADC TDR64 357

Unclassified report

Descriptors: (*Microwave equipment, Traveling-wave tubes), (*Traveling-wave tubes, Microwave frequency), (*Microwaves, Propagation), Circuits, Broadband, Radiofrequency power, Resonators, Dielectrics, Klystrons, Performance (Engineering), Frequency multipliers, S band, Oscillation, Waveguides.

Current work being accomplished is reviewed. Included topics are listed below: (I) Centipede TWT - Current results of theory and experiment are presented. (II) Periodic circuit studies - (a) Modifications of existing circuits and new circuits for high power TWT's for improvement of bandwidth, impedance, and stability are investigated. (b) Evaluation of an unshielded periodic array of small dielectric resonators as a positive-dispersion slow wave structure providing an axial H-field is presented. (III) Oscillation suppression in TWT's - An abstract from a report on TWT oscillation suppression (pulse edge) by means of coupling to an external lossless waveguide is given. (IV) Extended interaction klystrons - Assembly of an experimental three-cavity tube has been completed. (V) Transverse wave studies - Investigation of transverse wave propagation on an accelerated stream is continuing. (VI) Nonperiodic dielectric traveling wave tubes - This work has been discontinued. A statement of recommendations is contained herein.

AD-607 451 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
THE ROLE OF DIFFUSION CURRENT IN THE ELECTROLUMINESCENCE OF GaAs DIODES,
by M. F. Millea and L. W. Aukerman. 8 Sep 64,
13p TDR-269(4250-11)-5
Contract AF04 695 269
SSD TDR64 174

Unclassified report

Descriptors: (*Gallium alloys, Arsenic alloys), (*Diodes (Semiconductor), Electroluminescence), (*Electroluminescence, Electric currents), Semiconductors, Impurities, Zinc, Electrons, Diffusion, Electron bombardment.

The intensity of the principal emission band of zinc-diffused GaAs p-n junctions with about 2 x 10 to the 17th power cu cm in the n-type region is proportional to exp(qV/kT). The energy of the peak of this band is independent of the forward bias V for these diodes. If the principal emission band results from the recombination of electrons that diffuse across the junction, and if nonradiative recombination is by far the more probable, then the intensity of the principal emission band is proportional to tau exp(qV/kT), where tau is the minority carrier lifetime in the p-type region. This dependence on tau comes, in part, from the gradient of acceptor concentration in the p-type region. Irradiation with 2-MeV electrons decreases the intensity and increases the forward current at a given voltage. The decrease in intensity is consistent with the above model if 1/tau increases linearly with integrated flux. The increase in current is greater for larger bias, suggesting that only the diffusion component of current is affected by irradiation. (Author)

Interim rept. no. 2, Jun-Sep 64,
Sep 64, 28p
Contract AF33 615 1238

Unclassified report

Descriptors: (*Camera tubes, Manufacturing methods), Photocathodes, Vacuum seals, Vacuum apparatus, Photosensitivity, Processing, Photomultiplifiers, Diodes, Degasification, Contamination, Indium, Tests.

Studies have been continued in the application of remote processing techniques as directed toward camera tube fabrication. Advantages of the subject method of photocathode formation are as follows: 1. Ability to remotely process photocathodes on substrates without exposing component tube assemblies to contamination of alkali vapors normally associated with conventional tube processing techniques. 2. Means of forming several photocathodes in the processing chamber and thereby permitting the selection of the photosurface of highest sensitivity for sealing to the electron device. 3. Facility of providing an extremely high vacuum during the time of photocathode transfer and sealing to the main tube assembly. 4. Elimination of photocathode formation components from within the envelope, allowing tube designs of more compact nature. Within the period including June through September 1964, efforts were directed toward fabrication of photodiode and non-imaging photomultiplier configurations, utilizing S-20 and S-21 photosurfaces. (Author)

AD-607 509 Div. 8
OTS Prices: HC $4.00/MF $0.75

Illinois Univ., Urbana. Engineering Experiment Station.
ANTENNA ARRAY EVALUATION SYSTEM.
Technical rept. no. 9,
by Edward W. Ernst, William C. McClurg, and Leon J. Miller. Sep 64, 116p RRL-261
Contract Nobsr89229

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Antennas, Test equipment), (*Test equipment, Antennas), Test methods, Electronic switches, Direction finding, Multibeam antennas, Goniometer, Radio signals, Antenna radiation patterns, Switching circuits, Simulators, Diodes (Semiconductor), Circuits.

The approach which has been followed is to connect the antennas sequentially, to a receiver while the source remains essentially fixed in location. Thus, since the elements are (to a first approximation) identical, the effect is that of 'rotating' the array. The sequential connection of the elements to the receiver must be done rapidly so the source and other potential variables can be maintained essentially constant during the period of a single rotation. For this purpose, scanning rates typical of goniometer speeds would appear to be appropriate. That is, in the range of 90 to 900 rpm, or 1.5 to 15 scans per second. Rather than use a rotating system, such as a goniometer, a discrete switching system has been devised. To permit the high speed switching necessary, electronic commutation techniques employing semiconductor diodes have been utilized. The signals to drive the diode switches are, in turn, derived from semiconductor digital logic circuits. This has permitted considerable flexibility of operation of the test system without excessive complexity.

AD-607 512 Div. 8
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge Inc., Los Angeles, Calif.
FM CAPTURE PERFORMANCE AND ITS CONSIDERATION IN RECEIVER DESIGN,
by A. W. Emmons. 22 Jul 57, 28p GM-TR-219

Unclassified report

Descriptors: (*Frequency modulation, Radio receivers), (*Radio receivers, Design), Limiters, Discriminators, Tuned circuits, Radio interference, Amplifiers, Multipath transmission, Phase modulation, Bandwidth, Circuits.

This paper presents some receiver design considerations for FM capture. To permit the omission of lengthy mathematical operations, the discussion is qualitative in nature. References are provided in which detailed treatment of the particular subject considerations can be found. (Author)

AD-607 523 Div. 8
OTS Prices: HC $2.00/MF $0.50

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME I. SUMMARY OF RESULTS.
Final rept. for Mar 63-Mar 64.
Jul 64, 42p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V1

Unclassified report

Descriptors: (*Coding, Errors), Corrections, Control, Communication theory, Reviews.

This research was primarily devoted to the application of error control techniques. This discipline has developed a body of knowledge that can be extremely valuable to communication systems designers if criteria for the use of error control coding can be developed. The work included an analysis of channel statistics that leads to a computer program designed to choose an optimum error control technique from standard channel statistics and data transmission parameters. Variable length, variable redundancy codes and their applications were studied. Comparisons of block and recurrent codes were made; in addition a study was made of error propagation in recurrent codes. A cyclic decoding procedure for the familiar Bose-Chaudhuri-Hocquenghem code was developed. Comparisons were made between forward error correction codes and error detection codes with feedback and retransmission, with data throughput rate the criterion for comparison. Finally, a technique for combining error detection with message synchronization is described. (Author)

AD-607 524 Div. 8
OTS Prices: HC $3.00/MF $0.75

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME III. VARIABLE REDUNDANCY CODES.
Final rept.,
by R. T. Chien and D. T. Tang. Jul 64, 97p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V3

Unclassified report

See also AD-607 523.

Descriptors: (*Coding, Errors), Corrections, Redundant

A simplified charge distribution analysis and the experimental determination of the figures of merit, gain-bandwidth and power gain, were utilized to predict the operation of the P-ICFET in the RF range. A short-circuit admittance parameter equivalent model which was modified to include regenerative effects was completed with the subsequent design and construction of an 100 mc/s amplifier and oscillator. The typical P-ICFET amplifier exhibited a power gain of 8-15 db and as an oscillator had a power output of 2-4 milliwatts at an efficiency of 20-40%. (Author)

AD-607 484 Div. 8
OTS Prices: HC $3.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GENERALIZATION OF NODAL-SHIFT TECHNIQUES TO LOSSLESS n-PORT NETWORKS.
Master's thesis,
by John Irving Molinder. Aug 64, 76p
AFIT GE/EE/64 14

Unclassified report

Descriptors: (*Electrical networks, Impedance matching), Standing wave ratios, Electromagnetic wave reflections, Measurement, Networks, Electrical impedance, Matrix algebra, Circuits.

A procedure for generalizing nodal-shift measurements to lossless n-ports was presented in this thesis. The procedure involves reducing the n-port problem by steps to a series of two-port problems. This provides a method of determining the matched network reflection coefficients. The determination of the scattering matrix for a lossless reciprocal three-port given the matched reflection coefficients was also discussed. The diagonal elements of the scattering matrix are equal to the respective matched reflection coefficients. The magnitudes and angles of the off-diagonal elements may be determined within an angle ambiguity using the orthogonality conditions. (Author)

AD-607 485 Div. 8
OTS Prices: HC $3.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELECTRONIC COUPLING AND CIRCUIT ISOLATION USING AN ELECTRO-OPTICAL DEVICE.
Master's thesis,
by Neal H. Phelps, Jr. Aug 64, 77p
AFIT GE/EE/64 15

Unclassified report

Descriptors: (*Oscillators, Design), (*Semiconductor devices, Photoelectric effect), Diodes (Semiconductor), Gallium alloys, Arsenic alloys, Infrared radiation, Transistors, Silicon, Photons, Amplifiers, Electron optics, Circuits.

A load-sensitive LC oscillator was designed and constructed to demonstrate the effectiveness of a photon-coupled-pair (PCP), operating as a photon-coupled isolation amplifier (PCIA), in coupling a signal from the tank of the oscillator. Loading effects on the output of the oscillator are compared for both PCIA and capacitive methods of coupling. Results show that the PCIA provides complete isolation between load and oscillator for load resistance as low as 10K ohms. A new PCP showed promise of even greater isolation ability. In contrast, loading through capacitive coupling disabled the oscillator at a load value of 560K ohms. The use of the PCIA to isolate the load resulted in improvement of the oscillator frequency stability from a deviation of one part in 500 to one part in 100,000. Frequency response, distortion, and input-output characteristic curves are presented, along with an equivalent circuit, to: (1) assist in characterizing a typical PCP, and (2) provide tools necessary to explain the operation, limiting features, and isolation advantages of a PCP when it is used as an electronic signal coupler. (Author)

AD-607 499 Div. 8
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE OPTIMUM FILTERS FOR THE DETECTION OF COHERENT SIGNALS IN CORRELATED NOISE,
by J. Kroszczynski. 9 Oct 64, 17p
FTD TT64 622; TT 64 71603

Unclassified report

Unedited rough draft trans. of Przemyslowy Instytut Telekomunikacji, Warsaw. Prace (Poland) 1963, v. 13, no. 30, p. 1-8.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Communication theory, Filters (Electromagnetic wave)), (*Filters (Electromagnetic wave), Optimization), Demodulation, Signals, Bandwidth, Interference, Integral equations, Mathematical analysis, Poland.

Characteristics of filters appearing in systems realizing optimum reception in the presence of correlated and noncorrelated noise are discussed. The dependence is established describing the circumference of maxima of characteristics of narrow band filters at multi channel reception systems for the case of a great number of channels. Outlines are given, representing the form of the mentioned circumference in relation to the width of the band of correlated noise. (Author)

AD-607 501 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR MECHANIZATION OF HIGH-RELIABILITY CAPACITORS.
Quarterly rept. no. 6, 30 Mar-30 Jun 64,
by E. J. Burke and J. H. D. Folster. 30 Jun 64, 18p
Contract DA36 039AMC01460E

Unclassified report

Descriptors: (*Capacitors, Manufacturing methods), (*Paper capacitors, Manufacturing methods), Reliability (Electronics), Material forming, Industrial equipment, Machines, Pipes, Paper, Metals, Soldering, Conveyors.

Work on the production design engineering and design of pilot line equipment continues. Of the 28 major subassemblies which constitute the three machines of the mechanized high reliability capacitor production line, five are complete and another 18 are in various stages of production. (Author)

AD-607 503 Div. 8
OTS Prices: HC $2.00/MF $0.50

Westinghouse Electric Corp., Newbury Park, Calif.
ADVANCED PROCESSING TECHNIQUES FOR CAMERA TUBES.

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Triodes, Feasibility studies), Design, Processing, Vibration, Shock (Mechanics), Anodes, Cathodes, Switching circuits, Computers, Tolerances (Mechanics), Temperature, Voltage, Heat transfer, Geometric forms, Cylindrical bodies, Electron tubes, Ceramic materials, Molybdenum, Microminiaturization (Electronics).

The objective of this program was to determine the feasibility of a TIMM triode in the ten-watt class. The relative merits of both the planar and the cylindrical design were investigated. Processing and assembly steps were developed and experimental tubes of each design were constructed. Experimental tubes of each design were evaluated for electrical characteristics and performance under swept frequency vibration, shock, and life test conditions. The feasibility of both designs was demonstrated and some problem areas defined. Further effort in these areas is recommended. (Author)

AD-607 535 Div. 8
OTS Prices: HC $6.00/MF $1.25

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
DISTORTION INTRODUCED INTO FREQUENCY MODULATION BY ARBITRARILY LIMITING THE TRANSMISSION BANDWIDTH.
Master's thesis,
by Robert L. Burt and Adolph W. Foeh. Aug 64, 220p
AFIT GE/EE/64 2

Unclassified report

Descriptors: Frequency modulation, Bandwidth), (*Bandwidth, Distortion), (*Narrowband, Distortion), Wave transmission, Mathematical analysis, Digital computers, Demodulation, Radio signals, Bessel functions, Equations, Programming languages, Statistical data.

The distoriton introduced by arbitrarily limiting the transmission bandwidth of an FM wave can be obtained by solving the mathematical expression derived, verified, and illustrated in this thesis. Although the method explained will determine distortion of an FM wave modulated by the sum of any number of sinusoidal signals, the digital computer solution time becomes excessive when more than ten modulating signals are applied. Solutions graphically illustrated include modulating signals of; single sinusoids with modulating indices varying from 0.3 to 50.0, two through six non-harmonic sinusoids, and triangular pulse represented by the first six terms of its Fourier series. (Author)

AD-607 549 Div. 8
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
CIRCUIT DESIGN RELIABILITY THROUGH REDUNDANCY,
comp. by James R. Trew. 15 Aug 60, 31p
STL/AB 60-5111-38, STL-B-38

Unclassified report

Rept. on a Literature Survey of Unclassified Reports.

Descriptors: (*Bibliographies, Reliability (Electronics), (*Reliability (Electronics), Redundant components), Circuits, Design, Abstracts, Reviews.

A compilation of abstracts.

AD-607 561 Div. 8
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth N. J.
SECONDARY BREAKDOWN, RADIATION RESISTANCE AND FREQUENCY RESPONSE OF SILICON TRANSISTORS,
by Bernard Reich and Edward B. Hakim. Jun 64,
20p
Proj. 1G622001A056 01
USAEL TR24 63

Unclassified report

Descriptors: (*Transistors, Silicon), (*Reliability (Electronics), Transistors), Neutrons, Nuclear particles, Voltage, Electric discharges, Gain, Bandwidth, Performance (Engineering), Radiation damage.

This report points out the considerations that have to be taken into account when choosing a transistor which has good neutron radiation resistance and, in addition, secondary breakdown performance. There appears to be a point where optimum performance is obtained considering both requirements. However, the representation indicated can only be considered a static case since secondary breakdown is itself dependent on the amount of neutron exposure the device receives. (Author)

AD-607 562 Div. 8
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CONTACTLESS PHOTOPOTENTIOMETER,
by S. V. Svechnikov. 14 May 64, 10p
FTD TT64 321; TT 64 71608

Unclassified report

Unedited rough draft trans. of Avtomatika i Telemekhanika (USSR) 1963, v. 24, no. 9, p. 1292-1294. Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Potentiometers, Photoconductivity), (*Photoconductivity, Potentiometers), Photosensitivity, Phototubes, Illumination, Voltage, Photoelectric materials, Resistance (Electrical), USSR.

The possibility of using photoresistors as elements of contactless potentiometers controllable in the function of voltage is discussed. Results are presented of elementary investigation of photopotentiometers on the basis of photoresistors of the type FSK-M and SKF-M.

AD-607 566 Div. 8
OTS Prices: HC $1.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
THE RELATIONSHIP BETWEEN TRANSISTOR SECONDARY BREAKDOWN PERFORMANCE TO VHF LARGE SIGNAL AMPLIFIER PERFORMANCE,
by Bernard Reich and Edward B. Hakim.
Jun 64, 20p
Proj. 1P622001A056 01
USAEL TR2492

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Transistors, Reliability (Electronics), (*Transistor amplifiers, Very high frequency), Performance (Engineering), Voltage, Electric discharges, Radiofrequency power, Radiofrequency amplifiers, Failure (Mechanics), Metal coatings, Direct current.

components, Computer logic, Wiring diagrams, Mathematics, Communication theory.

Contents: On the implementation of error correcting codes, dual codes variable redundancy codes, cyclic product codes with variable redundancy, on variable length codes as variable redundancy codes, on detecting errors after correction, mode control in communications systems using variable redundancy codes, and burst-error cyclic codes generated from cyclic groups.

AD-607 525 Div. 8
OTS Prices: HC $3.00/MF $0.75

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME IV. RESIDUE CODES.
Final rept.,
by R. T. Chien. Jul 64, 86p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V4
Unclassified report

See also AD-607 524.

Descriptors: (*Coding, Errors), Corrections, Control, Mathematics, Communication theory.

Contents: Residue codes for burst errors, redundancy requirements in residue codes, cyclic decoding procedure for Bose-Chaudhuri-Hocquenghem codes, a class of optimum residue codes for burst-error-correction, cyclic residue codes for burst errors, redundancy requirements in residue codes, a cyclic decoder for Bose-Chaudhuri-Hocquenghem codes, and on the instrumentation of Bose-Chaudhuri-Hocquenghem codes.

AD-607 526 Div. 8
OTS Prices: HC $3.00/MF $0.75

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME V. ANALYSIS AND COMPARISON OF ERROR CONTROL TECHNIQUES.
Final rept.,
by R. J. Benice and A. H. Frey, Jr. Jul 64, 71p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V5
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-607 525.

Descriptors: (*Coding, Errors), Data transmission systems, Corrections, Control, Computer logic, Mathematics, Communication theory, Reviews.

Several retransmission logics are discussed and examined. Formulas are developed for the throughput rate R, which measures the proportion of the total bits transmitted that are actually new data, and the output error rate rho, which measures the proportion of the messages transmitted from the data source that are not received correctly at the data sink. These results are compared with each other and with standard forward error correcting codes for a wide range of hypothetical channels with independent and dependent error statistics.

AD-607 527 Div. 8
OTS Prices: HC $2.00/MF $0.50

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME VI. THE DESIGN OF ERROR CONTROL SYSTEMS.
Final rept.,
by R. J. Benice and A. H. Frey, Jr. Jul 64, 35p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V6
Unclassified report

See also AD-607 526.

Descriptors: (*Coding, Errors), Corrections, Control systems, Design, Systems engineering, Handbooks, Communication theory.

This report is presented in the format of a 'Handbook for Error Control Systems Design.' It is self contained and is designed for use by a systems engineer who may be completely unfamiliar with error control techniques. The handbook lists the required inputs and gives a flow chart, complete with formulas, to enable a computer to determine near optimum (with respect to cost) coding parameters if any coding parameters if any coding technique can be guaranteed to meet all of the requirements. The handbook is explained in detail. The formulas and procedures are explained and the validity of the procedures is established.

AD-607 529 Div. 8, 12
OTS Prices: HC $5.00/MF $1.00

Bendix Corp., Southfield, Mich.
INVESTIGATION OF TECHNIQUES FOR SPACE-ORIENTED TUBES.
Final rept.,
by John G. Meeker and A. G. Peifer. Sep 64, 178p
Contract AF30 602 2984, Proj. 5573, Task 557303
RADC TDR64 201
Unclassified report

Descriptors: (*Microwave amplifiers, Space environmental conditions), (*Electron tubes, Microwave frequency), (*Space environmental conditions, Microwave equipment), Van Allen radiation belt, Atmospheric temperature, Electromagnetic radiation, Magnetic fields, Planetary atmospheres, Electron beams, Traveling-wave tubes, Ceramic materials, Glass, Metals, Dielectric materials, Environmental tests.

The primary goal of the study was to establish criteria for designing high power microwave amplifiers capable of adequately functioning in environments associated with space missions. The expected space environment, both natural and artificial, was carefully catalogued and a special treatment for calculating the ionizing radiation of the Van Allen Belts developed, including assumptions and their degree of uncertainty. The effects of the over-all environment on the materials of a space tube package were evaluated and the materials given a preference ranking. The essential properties required of a space tube are also enumerated and means of achieving them discussed, in detail, for linear-beam tubes, especially for traveling-wave amplifiers required to operate in the range between 1 Gc at 10,000 watts CW and 10 Gc at 100 watts CW. Limitations and problem areas are pointed out and some new concepts are advanced. The importance of pre-flight testing is emphasized, and a philosophy of combined-environment testing advanced; sequential testing is also discussed. (Author)

AD-607 531 Div. 8, 30
OTS Prices: HC $3.00/MF $0.75

General Electric Co., Owensboro, Ky.
FEASIBILITY STUDY OF TIMM POWER TRIODE.
Rept. for 1 Jul 63-May 64,
by Robert M. Hughes and Et Al. Oct 64, 77p
Contract AF33 657 12329, Proj. 655A
AL TDR64 230
Unclassified report

writing was ± 0.005 inches. Analysis shows that maximum dimensional tolerance of ± 5.0 microns is possible to achieve for the one-step writing method. (Author)

AD-607 604 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Midland Mfg. Co., Inc., Kansas City, Kans.
CR-(XM-44)/ U MODERATE PRECISION GLASS ENCLOSED CRYSTAL UNITS.
Quarterly progress rept. no. 7, 1 Oct-31 Dec 63, by Robert Kinsman. 31 Dec 63, 36p
Contract DA36 039sc86717

Unclassified report

Descriptors: (*Quartz resonators, Experimental data), (*Crystal holders, Manufacturing methods), Aging (Materials), Production, Tests, Nickel, Electroplating, Quartz, Glass, Encapsulation, Processing, Seals (Stoppers).

The second set of engineering samples consisting of five crystals at each frequency were fabricated, tested, and shipped. Designs and test data for these crystals are listed. Some aging tests were made but, due to inadequate test equipment, results were of questionable value. (Author)

AD-607 612 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Los Angeles, Calif.
THE CALCULATION OF HIGHER HARMONICS OF PERIODICALLY SWITCHED A-C VOLTAGES,
by George H. Sichling. 1 Sep 59, 83p
STL/TN-59-0000-00325

Unclassified report

Descriptors: (*Harmonic analysis, Alternating currents), Switching circuits, Voltage, Fourier analysis, Series, Graphics, Functions, Special functions (Mathematical), Integrals.

The output waveform of switched semi-conductors and of magnetic amplifier circuits usually is not a pure fundamental waveform but contains harmonics which vary with the commutation. This paper analyzes three basic types of switched output waveforms; sinusoidal, rectified sinusoidal, and square wave. The results are summarized by sets of handbook-type curves from which the harmonics for various switching modes can be readily determined. Mathematical derivations are provided which make it possible to calculate the harmonics present for the most common switching modes. This information is useful in filter design as well as providing information for calculating losses in a load supplied with this waveform. In addition, the output waveform for the minimum harmonic content is indicated by the curves.

AD-607 614 Div. 8
OTS Prices: HC $1.00/MF $0.50

ITT Industrial Labs., Fort Wayne, Ind.
RESEARCH AND DEVELOPMENT TO IMPROVE THE RESOLUTION OF IATRON DIRECT VIEW STORAGE TUBES.
Interim development rept., phase II for 2 Jun-2 Sep 64, by R. W. Hunter. 28 Oct 64, 18p ITT-3306
Contract NObsr87264, Proj. SR00803, Task 9497

Unclassified report

Descriptors: (*Storage tubes, Resolution), (*Cathode ray tubes, Storage tubes), Electrodes, Brightness, Cathode ray tube screens, Electron beams, Electron tube parts, Electron lenses, Performance (Engineering).

The width of a stored line is a linearly increasing function of the percent of saturation brightness i.e., insulator charge established by the writing beam. The slope of this function is determined by the backing electrode mesh number and the gradients on each side of the storage target. Although the resolution measured with various backing electrode meshes is nearly the same at about 5 percent of saturation brightness, it improves with increasing mesh number at higher percentages of saturation brightness. Additional improvement in resolution can be obtained by increasing the gradient between the viewing screen and the backing electrode on 750 or 1000 mesh screens. This improvement is believed to be a result of reduced transit time. (Author)

AD-607 615 Div. 8, 12, 14, 17
OTS Prices: HC $2.00/MF $0.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
HIGH-TEMPERATURE ANTENNA INVESTIGATION.
Interim engineering rept. no. 6,
by G. F. Buranich. 30 Sep 64, 37p UB-1807-E-6
Contract AF33 657 11100, Proj. 6278, Task 627802

Unclassified report

Descriptors: (*Antennas, High-temperature research), (*Reentry vehicles, Slot antennas), Spiral antennas, S band, Waveguide slots, Waveguide windows, Aluminum compounds, Oxides, Niobium, Silicon compounds, Platinum, Nickel alloys, Refractory metals, Refractory coatings, Ceramic materials, Seals (Stoppers), Thermal expansion, Thermal stresses, Heat transfer, Coaxial cables, Dielectrics, Cooling, Fracture (Mechanics).

Experimental effort was continued on high-temperature models of waveguide slot, annular slot, and printed spiral antennas. Two separate alumina windows sealed across the open end of a columbium S-band waveguide have developed cracks after cooling. It appears that the nominally matched thermal coefficients of expansion of these materials are not exact enough to prevent fracture of thin alumina windows. An annular slot antenna assembly employing a corrugated metal disk/alumina window has been electrically matched. This assembly will provide information on the suitability of deformable assemblies to accommodate unmatched thermal expansion coefficients of materials. Fused silica and alumina substrates and fired-on platinum conductors have been used in high-temperature spiral antenna assemblies. The low loss of these substrates produces rapidly fluctuating VSWR values (with frequency), and the high dielectric constant of the alumina causes an apparent narrowing of antenna bandwidth. Power-handling tests of thoriated nickel obstacles in a waveguide showed no unusual performance as a function of temperature. (Author)

AD-607 629 Div. 8, 6, 19
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
STUDIES IN ELECTROMAGNETIC PROPAGATION.
PART I: REFRACTIVE CORRECTIONS.
31 Dec 58, 95p STL/GM-TM-0165-00307

Unclassified report

Descriptors: (*Electromagnetic waves, Ionospheric propagation), (*Tracking, Radio signals), (*Guidance, Radio signals), Atmosphere, Refractive index, Electromagnetic wave reflections, Radiofrequency interference, Spacecraft, Guided missiles, Position finding, Errors.

An attempt has been made to find a relationship between transistor secondary breakdown as noted at low frequencies with the performance of transistors as VHF large signal amplifiers. The study tends to indicate that if secondary breakdown limits the performance of r.f. power transistors, the maximum power output of the device is limited by the d.c. operating point at which secondary breakdown occurs. Upon visual inspection of units destroyed in these experiments, it has been found that consistent metalization failures have occurred in the vicinity of the emitter lead and that failures noted under r.f. conditions have been much more severe than those noted under d.c. burnout conditions. (Author)

AD-607 576 Div. 8, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DEVELOPMENT OF INFORMATION PROCESSING CIRCUITRY FOR AN ALL-ELECTRONIC INFRARED HORIZON SCANNER,
by K. C. Priore. Dec 60, 37p STL/TN-60-0000-19107
Unclassified report

Descriptors: (*Horizon scanners, Infrared equipment), (*Infrared equipment, Circuits), (*Attitude control systems, Satellites (Artificial)), Vidicons, Video signals, Image tubes, Gates (Circuits), Switching circuits, Semiconductor devices, Reliability (Electronics), Wiring diagrams, Design, Data processing systems.

The report describes the development of information processing circuitry for the all-electronic infrared horizon scanner. Two different information processing schemes are described: Video pulse switching and modulated carrier gating. In the video pulse switching scheme, pitch and roll attitude error signals are derived by proper processing of the vidicon tube's video pulse output. In the modulated carrier gating method, pitch and roll attitude error signals are derived by using the vidicon tube's video pulse output as a gating pulse, gating deflection voltage ramp signals which are further processed to obtain output error signals. The relative merits of each scheme are discussed in terms of circuit simplicity and reliability.

AD-607 583 Div. 8
OTS Prices: HC $6.00/MF $1.25

International Business Machines Corp., Bethesda, Md.
ERROR CONTROL THROUGH CODING. VOLUME II. RECURRENT BURST-ERROR-CORRECTING CODES. Final rept.,
by C. V. Freiman, J. P. Robinson, and A. D. Wyner. Jul 64, 241p
Contract AF30 602 2958, Proj. 4519, Task 451903
RADC TDR64 149 V2
Unclassified report

See also AD-607 523.

Descriptors: (*Coding, Errors), Corrections, Control, Redundant components, Signals, Sequences, Groups Mathematics), Communication theory.

An encoded recurrent-code message will usually consist of a sequence of blocks of b digits where each block contains m redundant or dependent digits and b-m information or independent digits. Unlike block codes, the values assumed by the redundant positions in a particular block no longer depend upon the information digits of that block alone but, in general, depend upon the information digits of N/m blocks where N is a multiple of m. The work is divided into four major categories: (i) lower bounds on the redundancy of recurrent codes; (ii) upper bounds on the redundancy of recurrent codes; (iii) comparison of block codes and recurrent codes; and (iv) error propagation in recurrent codes.

AD-607 590 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
COMMUNICATION SATELLITE OUTPUT DEVICES,
by N. E. Feldman. Sep 64, 61p P-2997
Contract NASr21 02
Unclassified report

This paper appears as 'Section V. Satellite Output Devices' of RAND RM-4298-NASA, Multiple Access Techniques for Communication Satellites: I. Survey of the Problem, Sep 64.

Descriptors: (*Communication satellites (Active), Power amplifiers), (*Power amplifiers, Semiconductor devices), (*Semiconductor devices, Power amplifiers), (*Electron tubes, Power amplifiers), Tunnel diodes, Transistors, Varactor diodes, Tirodes, Klystrons, Traveling wave tubes, Backward-wave amplifiers, Frequency multipliers, Reliability (Electronics), Microwave frequency, Amplifiers.

This paper reviews the relative ability of semiconductor devices, such as tunnel diodes, transistors, and varactor diodes, and vacuum tube amplifiers, such as triodes, klystrons, amplitrons, and traveling wave tubes, to generate signal power efficiency at frequencies of 1 to 10 kmc and power levels of 0.1 to 100 watts in communication satellite applications.

AD-607 594 Div. 8, 24
OTS Prices: HC $3.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
PROJECTION PHOTOLITHOGRAPHY FOR USE IN MICROCIRCUIT FABRICATION,
by William B. Glendinning, Sidney Marshall, Albert Mark, and Thomas F. Brooks. May 64, 56p
Task 1G622001A056 02
USAEL TR2461
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Subminiature electronic equipment, Circuits), (*Lithography, Printed circuits), (*Printed circuits, Lithography), Photographic emulsions, Photographic images, Integrated circuits, Silicon, Photographic projectors, Microminiaturization (Electronics).

A new photographic technique for use in the construction of photo and process masks is discussed. The projection writing technique was used to produce various masks which are comparable in characteristics and quality to those currently being made via contact and other photographic techniques within the microelectronic industry. The zero velocity writing method produced process mask patterns with line boundary definition of less that 5 microns. Rectangular corners of photo masks projected light images having rounded corners with radii of less than 10 microns. Exposure time intervals of 2.0 to 4.0 seconds were used to produce complex micro-circuit-type photo masks using one-step reduction factors of 4.0 to 22.0. Writing velocities of 6.0 to 0.25 millimeters per second produced useful photo mask forms upon high resolution plates. Maximum dimension tolerance obtained in experimental

AD-607 690 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
THE TRANSISTOR TETRODE AS A VARIABLE GAIN COMPRESSIVE DEVICE,
Bachelor of Science thesis,
by Richard Werner Procunier. 26 May 58, 27p T-190
Contract AF04 647 103
Unclassified report

Descriptors: (*Transistors, Tetrodes), (*Tetrodes, Transistors), Gain, Semiconductors, Silicon, Circuits.

The transistor tetrode provides a new approach to variable gain in semiconductors. Present manufacturing standards do not provide a sufficient degree of uniformity to permit design of circuits without investigation of specific units. Tetrode gain characteristics are defined and investigated and practical examples given. (Author)

AD-607 698 Div. 8, 2, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ESTIMATES OF IONOSPHERIC GUIDANCE NOISE WHEN TRACKING OBJECTS AT GREAT HEIGHTS,
by Donald J. Farmer. 26 Jun 58, 9p
STL/GM-TN-0165-00152 Unclassified report

Descriptors: (*Atmospherics, Radar tracking), (*Radar tracking, Spacecraft), Radar interference, Radar equipment, Electron density, Ionospheric propagation, Atmospheric refraction, Measurement, Errors.

A brief summary of atmospheric effects is presented, principally those due to the ionosphere, which affect the accuracy of radar tracking systems when used to observe space vehicles at heights of several hundred miles or more above the surface of the earth. The intent is to indicate the magnitude of irreducible tracking errors and their dependence on the radar system operating frequency. (Author)

AD-607 711 Div. 8, 30
OTS Prices: HC $2.00/MF $0.50

Coordinated Science Lab., Univ. of Illinois, Urbana.
DISTRIBUTED NETWORK SYNTHESIS AND APPROXIMATION IN THE TIME DOMAIN,
by R. A. Rohrer, J. A. Resh, and R. A. Hoyt.
Jul 64, 26p CSL-R-222
Contract DA28 043AMC00073E
Unclassified report

Descriptors: (*Electrical networks, Synthesis), (*Input-output devices, Electrical networks), Time, Taper, Circuits, Theory, Numerical analysis, Calculus of variations, Time lag theory.

Conditions were obtained for the realization of the best approximation to a desired time domain input-output relation by means of a distributed network of a given class. Practical constraints were considered in obtaining the optimal (one-dimensional) spatial dependence for a series R-L, shunt G-C distributed network. The general results were specialized to L-C and R-C lines. (Author)

AD-607 728 Div. 8, 14
OTS Prices: HC $2.00/MF $0.50

Brunswick Corp., Marion, Va.
DEVELOPMENT OF A 1200F RADOME.
Interim engineering rept. no. 6, 1 Jul-30 Sep 64,
by V. A. Chacse and R. L. Copeland. 30 Sep 64,
41p
Contract AF33 657 11469, Proj. 4161, Task 416102
Unclassified report

Descriptors: (*Laminates, Radomes), (*Radomes, Composite materials), (*Composite materials, Radomes), Reinforcing materials, Aging (Materials), Ceramic materials, Aluminum compounds, Phosphates, Coatings, Compressive properties, Elasticity, Electrical properties, Glass textiles, Tensile properties, Filament wound construction, Temperature.

The work covered within this report involves investigation into new matrices and laminate processing improvements. Additional information is reported on the effect of curing atmospheres on laminate strength. Curing under nitrogen extends the life of the protective coating at elevated temperatures but for less than 100 hours. Mechanical and electrical properties data on the improved composite are reported. The mechanical strengths have been markedly improved through the matrix-processing investigation. Initial results on the filament winding feasibility study are reported and indicate a potential for this type of reinforced ceramic composite. A discussion of problem areas, conclusions and recommendations is also presented. (Author)

AD-607 730 Div. 8
OTS Prices: HC $2.00/MF $0.50

Syracuse Univ., N. Y. Coll. of Engineering.
FAILURE MECHANISMS OF TUNNEL DIODES,
Final rept.,
by Glenn M. Glasford, Richard L. Anderson, and Rajendra P. Nanavati. Sep 64, 48p EE-959-630TDR-2
Contract AF30 602 2778, Proj. 5519, Task 551902
RADC TDR64 313
Unclassified report

Descriptors: (*Tunnel diodes, Failure (Mechanics)), (*Failure (Mechanics), Tunnel diodes), Semiconductor devices, Reliability (Electronics), Gallium alloys, Arsenic alloys, Voltage, Electric currents, Impurities, Electric fields.

Experimental evidence is presented which shows that the deterioration in the current-voltage characteristics of GaAs tunnel diodes when operated at a high forward bias results from recombination of injected electrons. The recombining electron gives its energy to the acceptor impurity atom and excites it from a substitutional site to an interstitial site. Associated with this Frenkel defect is a rearrangement of electronic states which, in turn, is responsible for the degradation of the current-voltage characteristics. It is postulated that it may be possible to fabricate GaAs tunnel diodes which do not fail, by using acceptor atoms having high activation energies. This might be feasible if the acceptor dopant can be incorporated into the GaAs in sufficiently heavy quantities. Studies of failure of GaSb tunnel diodes which sometimes show somewhat different failure modes with respect to changes in peak and valley currents indicate that in the wider band gap materials, the high electric field in the transition region plays an important part in the failure mechanism. It is predicted that tunnel diodes made from wide band gap materials and also from direct band gap materials, such as GaSb, in which the direct recombination process is important, will fail faster than those made from narrow band gap and/or indirect band gap materials. (Author)

This report is one of a special series devoted to those problems of electromagnetic propagation which affect radio tracking and guidance of missiles and space vehicles. The information on which these reports is based has come from two sources: (1) previous investigation, both experimental and theoretical; (2)experimental simulation programs initiated by AFBMD and STL and theoretical studies made at STL. These studies were designed to anticipate and measure the fundamental physical limitations imposed by the atmosphere upon radio guidance. This material has been brought together in an effort to produce a unified current picture of propagation phenomena. (Author)

AD-607 660 Div. 8, 4, 14
OTS Prices: HC $2.00/MF $0.50

Army Electronics Labs., Fort Monmouth, N. J.
ELECTRONIC PROPERTIES OF AROMATIC COMPOUNDS,
by Carol K. Pearce. Aug 64, 32p
Task 1C014501B13A26
USAEL TR2499

Unclassified report

Descriptors: (*Aromatic compounds, Electrical properties), (*Electronic equipment, Aromatic compounds), Radiation chemistry, Optical phenomena, Lasers, Magnetic properties, Paramagnetic materials, Electrical conductance, Atomic energy levels, Complex compounds, Metalorganic compounds, Crystals, Polymers, Reviews.

Aromatic compounds are potentially useful for electronic devices. Characteristics basic to an understanding of this group of organic compounds are discussed. Some recent achievements in areas relevant to eventual use of these compounds in electronic devices, are presented. (Author)

AD-607 663 Div. 8
OTS Prices: HC $3.00/MF $0.75

Naval Ordnance Lab., Corona, Calif.
VLF SUPERDIRECTIVE ARRAY WIDEBAND COMPONENTS,
by E. W. Seeley. 15 Oct 64, 64p
Task R360FR104 211 1R011 01 01
NAVWEPS 8202

Unclassified report

Descriptors: (*Loop antennas, Very low frequency), (*Antenna components, Loop antennas), Performance (Engineering), Preamplifiers, Mixers (Electronics), Transformers, Antenna configurations, Transmission lines, Broadband, Phased arrays, Electrical impedance, Electrical properties, Antenna radiation patterns, Design.

If improperly designed, the loops, preamplifiers, mixers, and transmission lines tend to deteriorate the directivity of VLF superdirective arrays in which they are used. This report describes the characteristics required of these components when used experimentally in superdirective arrays. Reception patterns of these arrays and illustrations of the respective capabilities of the components are given. (Author)

AD-607 665 Div. 8
OTS Prices: HC $2.00/MF $0.50

General Electric Co., Owensboro, Ky.
C-BAND TRIODE-CAVITY OSCILLATORS, PRODUCTION ENGINEERING MEASURE.
Quarterly progress rept. no. 5, 1 Jun-31 Aug 64,
by J. D. Marshall. 31 Aug 64, 28p
Contract DA36 039AMC01474E

Unclassified report

Descriptors: (*Microwave oscillators, Triodes), (*Triodes, Microwave oscillators), C band, Tests, Performance (Engineering), Manufacturing methods, Ceramic materials, Test methods, Quality control, Stabilization, Radiofrequency.

The test specifications for preproduction and pilot production testing were finalized. The cavities representing the preproduction run were assembled and tested. The Inspection and Quality Control Manual was completed and submitted. (Author)

AD-607 676 Div. 8, 2, 5
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
PROPAGATION OF LONG WAVES AROUND THE EARTH,
by O. Zinke. 15 Sep 48, 33p T-13
TT 64 71625

Unclassified report

Ausbreitung Langer Wellen um die Erdkugel, trans. of Frequenz (West Germany) 1947, v. 1, no. 1, p. 16-22. Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Radio waves, *Ionospheric propagation), (*Ionospheric propagation, Radio waves), Wave transmission, Earth, Propagation, Damping, Noise, Radio transmission, Very low frequency, Mathematical analysis, West germany.

For the field strength of electrical, very long waves a relation is derived which is valid especially for long distances up to approximately 20,000 km. As compared with the known Austinian formula, the new field strength formula differs chiefly in 3 points: (a) the functional relationship with distance; (b) the effect of wave length of the damping factor; and (c) the effect of noise at the antipole of the transmitter. With the aid of ionosphere data gained empirically for short wave propagation, this representation is to furnish a clear picture of the propagation of very long waves. At long distances it yields higher field strength values than does the Austinian formula and agrees better with measured values. (Author)

AD-607 689 Div. 8
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE PROBABILITY OF AN n-COINCIDENCE,
by A. R. Livshits. 15 Oct 58, 15p T-102
TT 59 10795

Unclassified report

Trans. of Radiotekhnika i Elektronika (USSR) 1957, v. 2, no. 8, p. 947-950.

Descriptors: (*Coincidence counting, Radiofrequency pulses), (*Radiofrequency pulses, Coincidence counting), Electromagnetic pulses, Sequences, Statistical functions, Probability, Equations, USSR.

This paper examines the problem of determining the probability of pulse coincidence in n-pulse random sequences. Formulae are derived which enable one to determine both the probability and average duration of pulse coincidence in sequences containing pulses with equal or unequal pulse widths. (Author)

structure giving the most promise. The technology for the photoformed line on sapphire was proven using an intermediate layer of titanium to bond the copper to the support, photo-etching, then subsequent thickening by copper plating. Cold testing of S-band scale models indicated that the dissymmetric fenced line is advantageous in terms of suppressing unwanted modes, but is more dispersive than would be desired and interacts with only the center part of the beam. Attempts to eliminate surface roughness of ceramic base materials by glazing has not yet yielded satisfactory deposition of delay lines. Improved ceramics are being sought. Measurements verified the published values of thermal conductivity for beryllia and have shown that the sapphire support is at best marginal for the 2 kw output required. An overall tube design with a gridded gun for noise reduction is outlined. (Author)

AD-607 774 Div. 8
OTS Prices: HC $9.60/MF $2.75

General Electric Co., Holyoke, Mass.
HIGH POWER, HIGH VOLTAGE, AUDIO FREQUENCY TRANSFORMER DESIGN MANUAL.
Final rept. for 1 Jul 62-31 Aug 64,
by J. G. Howe, R. D. Smith, J. J. Kingsley, and R. E. Gearhart. 31 Aug 64, 663p
Contract NObsr87721, Proj. SR008 03 02, Task 9599
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Transformers, Audiofrequency), Design, Voltage, Specifications, Circuits, Electrical properties, Winding, Electric insulation, Coils, Electric wire, Electrical equipment, Cooling, Distortion.

This final report, or transformer design manual, is divided into eight sections. Sections 1, 2 and 3 are the Abstract, Objectives and Definitions of Symbols respectively. Section 4 covers information of interest to the transformer user as well as the designer. This section includes a discussion on the transformer mechanical and electrical specifications, the test requirements, and the effect of the specifications on the transformer size, weight, and cost. Section 5 covers the audio frequency transformer design procedure. Here the design of an audio transformer has been broken into a step-by-step outline. Each step is briefly described, all necessary equations are listed and defined, and pertinent factual data is presented in tables and curves. Section 6 presents the procedural detail used to calculate the various parameters needed in the step-by-step design section. Section 7 includes the step-by-step design for the 350 kilowatt verification unit. The design summary for the 15 kilowatt and the 100 kilowatt units is also included. The test results for the three verification units are presented and discussed in this section. Section 8 is a complete bibliography of the literature researched during the contract period.

AD-607 793 Div. 8, 26
OTS Prices: HC $1.00/MF $0.50

General Electric Co., Schenectady, N. Y.
PRODUCTION ENGINEERING MEASURE FOR VOLTAGE-TUNABLE MAGNETRONS.
Quarterly progress rept. no. 8, 18 Jan-18 Apr 64,
by E. G. Soulier. 18 Apr 64, 24p
Contract DA36 039SC86722
Unclassified report

See also AD-600 094.

Descriptors: (*Magnetrons, Manufacturing methods), Anodes (Electron tubes), Voltage, Density, Magnets, Vibration, Tests, Performance (Engineering), Quality control, Frequency modulation, Filaments, Resistance (Electrical).

A summary of the problems encountered during the preproduction run is stated. Cumulative yield percentages obtained at the various basic tube subassembly stages are given. Production of ZM-6104 packages, which was limited by the inability of the packages to meet the specification's minimum anode voltage caused by the low flux-density level of the magnets, is described in detail. Conclusions for the detailed vibration testing of the tubes are given. Results in the quality-control area are stated. (Author)

AD-607 804 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

General Electric Co., Schenectady, N. Y.
PRODUCTION ENGINEERING MEASURE FOR VOLTAGE-TUNABLE MAGNETRONS.
Quarterly progress rept. no.9, 18 Apr-18 Jul 64,
by E. G. Soulier. 18 Jul 64, 31p
Contract DA36 039SC86722
Unclassified report

Descriptors: (*Magnetrons, Manufacturing methods), Quality control, Performance (Engineering), Vibration, Tests, Frequency modulation, Filaments, Resistance (Electrical).

The yield percentages obtained at the various basic tube sub-assembly stages are given. Results of vibration FM performance on the ZM-6103 and ZM-6104 packages are stated; conclusions, based on these results, are also included. Test data and illustrations are presented to substantiate these conclusions. Results of the Engineering samples that were retested are given. A comparison of the present specification with the proposed specification is included. (Author)

AD-607 813 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
REVIEW OF SOLID-STATE MASER AMPLIFIERS,
by J. M. Andres. 26 Jun 58, 18p
STL/GM-TN-0165-00151
Unclassified report

Descriptors: (*Masers, Solid state physics), (*Solid state physics, Masers), Atomic energy levels, Paramagnetic materials, Crystals, Circuits, Gain, Bandwidth, Noise (Radio), Microwave amplifiers, Pumping (Electronics), Electronics, Equations.

Some of the more recent activities concerning solid-state maser amplifiers are reported. The most important characteristic of these amplifiers is their ability to amplify without introducing noise into the amplified output. The usual sources of vacuum tube noise are not present and noise from cavity thermal radiation can be minimized by operating at very low temperatures. Noise figures very near to the theoretical limit seem to be obtainable. Some of the equations governing the behavior of these devices are presented, as well as some of the experimental measurements of their amplification properties.

AD-607 841 Div. 8
OTS Prices: HC $1.00/MF $0.50

Hughes Aircraft Co., Culver City, Calif.

AD-607 731 Div. 8
OTS Prices: HC $4.00/MF $1.00

Microwave Lab., Stanford Univ., Calif.
STUDIES OF THE EFFECT OF CIRCUIT TAPERING ON TWT PERFORMANCE,
by C. C. Lo. Sep 64, 135p
Contract AF30 602 2575, Proj. 5573, Task 557303
RADC TDR64 322
Unclassified report

Descriptors: (*Traveling-wave tubes, Performance (Engineering)), (*Circuits, Taper), Pulse amplifiers, Design, Oscillation, Electrons, Velocity, Standing wave ratios.

The main object of this research was to show that by proper tapering of the circuit characteristics of a pulsed, high-power traveling-wave amplifier, long-persisting pulse-edge oscillations could be successfully eliminated. Several types of circuit tapering have been considered, and a particular one was chosen for this empirical study. The type of circuit taper, which appears to have several advantages over others for suppression of pulse-edge oscillations, has both the pi-mode frequency increased and the phase velocity for the passband frequencies decreased gradually toward the output end of the tube. The effect of circuit tapering on forward-wave amplification has also been studied. A method was introduced for calculating the performance and an increase in gain was predicted for the aforementioned taper by this method when the tube was operated beyond the small-signal level. This effect was also measured experimentally on a high-power tube constructed for this purpose. The effect of circuit tapering on tube efficiency has been studied qualitatively. By using the conventional velocity-phase diagram, the possibility of improving the efficiency is indicated. However, a different kind of circuit tapering other than that used for this study is required.

AD-607 736 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Microwave Associates, Inc., Burlington, Mass.
BROADBAND SOLID-STATE SWITCHES.
Quarterly rept. no. 5, 1 Jul-30 Sep 64,
by L. Nathanson. 30 Sep 64, 31p
Contract NObsr89463, Proj. SR0080302, Task 9604
Unclassified report

See also AD-606 695.

Descriptors: (*Semiconductor devices, Electronic switches), (*Electronic switches, Semiconductor devices), Braodband, Microwave frequency, Diodes (Semiconductor), Temperature, C band.

Included is data pertaining to high power measurements of the L/S-band prototype switch employing 28 diodes in a 6.25 ohm line section. In addition, high power data is presented in reference to the high power testing of a C-band switch with 20 diodes in a 10 ohm line section. Other pertinent information discussed includes PIN diode temperature data, and diode leakage current as a function of reverse bias under a high power environment. (Author)

AD-607 744 Div. 8, 4, 25
OTS Prices: HC $1.00/MF $0.50

Chicago Univ., Ill.
ELECTRONIC PROPERTIES OF ORGANIC MOLECULES.
Final rept.
by David R. Kearns. Sep 61, 3p
Contract AF49 638 923
AFOSR 1475
Unclassified report

Descriptors: (*Organic compounds, Electrical properties), (*Aromatic compounds, Electrical properties), Quantum mechanics, Semiconductors, Atomic energy levels, Crystals, Reviews.

The work was concerned with the application of quantum mechanics to the interpretation of certain electronic properties of aromatic organic molecules. The results of this work appear in the three articles which are briefly reviewed.

AD-607 745 Div. 8
OTS Prices: HC $2.00/MF $0.50

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
SOME ASPECTS OF TRANSISTOR DEMODULATORS,
by Philip J. Rasch. Feb 62, 38p E-1132
Contract AF04 647 303, Proj. 52 156
BSD TDR62 129
Unclassified report

Descriptors: (*Demodulators, Transistors), (*Transistors, Demodulators), Circuits, Operation, Switching circuits, Electronic switches, Performance (Engineering), Voltage.

In order to present the transistor demodulator, the necessary theory of transistor switches is reviewed. Comparing it to an ideal switch, the method of operation of a transistor switch is presented, and the deviations from the ideal are developed. Using an equivalent circuit for the transistor in the saturated and cutoff regions, it is shown that the offset voltage and current of the switch is lowest in the inverted connection. The transistor demodulator is presented as a phase-sensitive a-c to d-c converter. In order to prove that the circuit operates for all polarities and all permissible levels of input signal, a complete analysis of the switching cycle is presented. From this study, the maximum back voltages across the junctions are determined. A practical demodulator is presented, and performance data on this circuit is given. (Author)

AD-607 752 Div. 8
OTS Prices: HC $3.00/MF $0.75

Warneke Electron Tubes, Inc., Des Plaines, Ill.
STUDY OF INTERACTION STRUCTURES LEADING TO DEVELOPMENT OF X-BAND CROSSED-FIELD AMPLIFIER, PHASE I.
Final engineering rept. for 28 Jun 63-28 Jun 64.
28 Jun 64, 86p
Contract NObsr89504, Proj. SF0100201, Task 9294
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-437 747.

Descriptors: (*Crossed field devices, Microwave amplifiers), (*Microwave amplifiers, Crossed field devices), X band, Delay lines, Gain, Band width, Dielectrics, Attenuation, Radiofrequency power, S band, Photoengraving, Copper, Sapphires, Titanium, Ceramic materials, Oxides, Beryllium compounds, Aluminum compounds, Amplifiers, Tests, Design.

A fenced line formed by photo-engraving of copper on a support of polished sapphire was selected as the delay line

The effects of a mono-energetic, constant-dose-rate electron beam on four transistor types are discussed in this paper. Measurements were taken in the grounded emitter configuration both under ambient conditions and while each specific device was under irradiation. The resulting data is presented in a three-step reduction/representation technique which utilizes the variation of gain degradation with ambient forward current gain of the device (BETA O) in a nuclear environment. The three steps are (1) the graphical or first approximation, (2) the computer analysis, and (3) the third step check (the use of pre-irradiated devices in breadboarded circuits). A discussion of the Composite Test System used to obtain the parameter profiles under irradiation is included, along with complete design procedure and calculations in the appendix. The latter part of the paper is concerned with an investigation as to the validity of the accelerated testing concept in particular, and the whole present radiation effects program in general. An alternate type of radiation effects program is suggested. (Author)

AD-607 887 Div. 8
OTS Prices: HC $3.00/MF $0.75

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
A WIDEBAND VERTICAL INCIDENCE RADIO LOCATION ARRAY.
Technical rept. no. 7,
by Fred Ore. Sep 64, 60p RRL-259
NOBSR89229

Unclassified report

Descriptors: (*Antennas, Radio beacons), (*Antenna radiation patterns, Antennas), Radio beams, Antenna feeds, Log periodic antennas, Dipole antennas, Broadband, Performance (Engineering), High frequency, Impedance matching.

The feasibility of designing a wideband, high-efficiency vertical incidence antenna capable of providing either a single or split beam centered on the zenith has been investigated by the use of scale models. It was found that two log-periodic dipole array elements arranged in an H-plane array fed properly over ground would provide the required beam configuration in the H-plane. A performance investigation as a function of the various design parameters was conducted where the design parameters' variation was limited to some extent by the practical considerations involved in an antenna designed for the 2 to 32 Mc frequency range. It was found that there existed a combination of parameters which would provide a reasonably good compromise between ideal pattern and impedance performance, the impedance performance being the more critical of the two. During the parameter investigation some interesting antenna feed problems were encountered and investigated to the extent of solving the problems for the special applications involved in the model studies being conducted. (Author)

AD-607 908 Div. 8, 7, 25, 30
OTS Prices: HC $5.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATIONS IN THE FIELD OF RADIOTECHNICAL MEASUREMENTS,
ed. by B. E. Rabniovich. 15 Sep 64, 169p
FTD MT64 05; TT 64 71651

Unclassified report

Issledovaniya v Oblasti Radiotekhnicheskikh Izmerenii, edited machine trans. of Komitet Standartov, Mer i Izmeritel'nykh Priborov. Trudy Institutov Komiteta (USSR) 1961, no. 53(113) p. 1-126.

Descriptors: (*Electronic equipment, Test methods), (*Test equipment (Electronics), Operation), Radio-frequency power, Calorimeters, Dielectric properties, Magnetic fields, Power meters, Electric bridges, Thermistors, Waveguides, Measurement, Electrical properties, Resonators, Pulse generators, Electrical impedance, Harmonic analysis, Voltage, Errors, Attenuators, USSR.

Contents: Scattering of power in coaxial load with external conductor of cylinderic form; Error of coaxial calorimetric power meter due to inequality of thermal losses; Error of thermistor bridge VIM-1 during measurement of pulse power; Method of reproduction of small voltages of high frequency; Standard method of reproduction of small voltages of high frequency on several harmonics; Investigation of errors of standard equipment for reproduction of small voltages at frequencies up to 1000 Mc; About increase of accuracy of measurement of attenuation by method of square-law detector; Investigation of method of measurement of attenuation with help of short-circuiting piston; Investigation of frequency errors of attenuator on wire resistances; Investigation of errors of approximate formulas for calculation of dielectric constant; Question of measurement of parameters of magnetodielectrics in decimetric wave range; Standard waveguide loads of centimeter range; Collation of methods of check of loop field-strength meters in field of induction and in field of radiation; Spectrum of generator of radio pulses with steep front; Error of harmonic analysis of voltage, made with help of measuring receiver with diode mixer.

AD-607 915 Div. 8, 26
OTS Prices: HC $2.00/MF $0.50

Stanford Research Inst., Menlo Park, Calif.
THIN-FILM COLD CATHODES FOR MICROWAVE TUBES.
Interim rept. no. 3,
by D. V. Geppert and B. V. Dore. Oct 64, 48p
Contract AF33 615 1345, Proj. 4812

Unclassified report

Descriptors: (*Films, Cathodes (Electron tubes)), (*Cathodes (Electron tubes), Microwave equipment), (*Cold cathode tubes, Microwave equipment), (*Microwave equipment, Cold cathode tubes), Zinc compounds, Oxides, Platinum, Sandwich construction, Barium compounds, Work functions, Life expectancy, Diodes (Semiconductor), Sintering, Cermets, Impurities, Semiconducting films, Substrates, Rare earths, Borides, Manufacturing methods, Oxidation, Excitation, Metal films, Electric currents, Density, Performance (Engineering).

Sintered ZnO layers have been intensively investigated, using both cold-press and hot-press techniques. Ohmic contacts between platinum substrates and the ZnO layers have been studied. The problem of obtaining blocking contacts between the ZnO and evaporated surface films has been studied, and barriers up to 2.7 ev can now be obtained. Evaporated BaO has been investigated as an activator for the surface films. Photo-electric work functions down to 1.75 ev have already been measured, and it is believed possible to reduce the work function down to about one ev by this technique. Life tests on ZnO diodes have continued and indicate no significant change in characteristics after almost 1000 hours of operation. (Author)

AD-607 928 Div. 8
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.

MINIMUM NOISE TEMPERATURE OF A PARAMETRIC AMPLIFIER,
by R. C. Knechtli and R. D. Weglein. Apr 59, 9p HAC-RR-108

Unclassified report

Descriptors: (*Parametric amplifiers, Noise (Radio)), (*Noise (Radio), Temperature), Pumping (Electronics), Electrical impedance, Capacitance, Semiconductor devices, Diodes (Semiconductor), S-band, Mathematical analysis, Theory.

The relation between noise temperature, pump power, and the measurable parameters of the nonlinear reactance in a parametric amplifier are derived. For a variable-capacitance amplifier, the attainable minimum noise temperature and the corresponding pump power are expressed in terms of the physical temperature of the variable capacitance, its Q, its law of capacitance variation, and the frequencies involved. The conditions under which contributions from the circuit losses are negligible are pointed out. The basic results of this analysis are: (1) The minimum attainable noise temperature is determined by the variable-capacitance parameters; (2) An optimum value of the ratio of idler to signal frequency for minimum noise temperature exists under certain conditions. This optimum does not necessarily correspond to an infinite value of this ratio; (3) Abrupt semiconductor junctions appear to have some advantage over diffused junctions as variable-capacitance elements for low-noise parametric amplifiers. Experimental results obtained at S-band have substantiated the above analysis. (Author)

AD-607 851 Div. 8, 25, 26
OTS Prices: HC $1.00/MF $0.50

Motorola, Inc., Phoenix, Ariz.
PRODUCTION ENGINEERING MEASURE. HIGH SPEED SEMICONDUCTOR SWITCH (TWO TERMINAL) AND HIGH SPEED SEMICONDUCTOR SWITCH (GATE).
Quarterly rept. no. 5, 29 May-28 Aug 64,
by B. G. Burlingame. 28 Aug 64, 18p
Contract DA36 039AMC01475E

Unclassified report

See also AD-603 660.

Descriptors: (*Semiconductor devices, Manufacturing methods), (*Electronic switches, Semiconductor devices), Semiconductors, Production, Bonding, Ultrasonic radiation, Electric terminals, Design, Electrical engineering, Epitaxial growth, Metal coatings, Gold, Phosphorus, Metalation, Processing, Adhesives, Switching circuits.

The purpose of the program is to establish a pilot production facility capable of producing high speed semiconductor switches in accordance with Signal Corps Technical Specification. The fifth quarter of the program has been used to develop assembly and surface preservation techniques, investigate alloy and epitaxial - including a metalizing technique for an epitaxial anode - methods, and fabrication of the third group of engineering samples. Mesa etching - a follow-up to previously conducted moat etching experiments - also was attempted.

AD-607 858 Div. 8
OTS Prices: HC $1.00/MF $0.50

Air Force Cambridge Research Lab., Bedford, Mass.
WEIGHT DISTRIBUTION OF THE QUADRATIC RESIDUE (71,35) CODE.
Physical and Mathematical Sciences Research Papers,
by Vera Pless. Aug 64, 13p
Proj. 5632
AFCRL 64 697; AFCRL PMSRP46

Unclassified report

Descriptors: (*Coding, Numerical methods and procedures), Groups (Mathematics), Determinants, Identities, Matrix algebra, Permutations, Communication theory.

The hand calculation of the weight distribution of the (71,35) quadratic residue code is briefly described. This calculation falls into two parts. The first part consists in evaluating the 10x10 determinant given by the power-moment identities, using properties of Van der Monde determinants. The second part of the calculation consists in reducing the six solutions obtained in the first part to one solution. This reduction is accomplished by group theory analysis. (Author)

AD-607 861 Div. 8
OTS Prices: HC $2.00/MF $0.50

SFD Labs., Inc., Union, N. J.
DEVELOPMENT OFAN X-BAND CW CROSSED-FIELD AMPLIFIER.
Interim development rept. for 1 Jul-30 Sep 64,
by W. Zettler. 30 Sep 64, 26p SFD-33-IDR-5
Contract NObsr89503

Unclassified report

Descriptors: (*Microwave amplifiers, Crossed field devices), (*Crossed field devices, Microwave amplifiers), X band, Impedance matching, Electron tubes, Performance (Engineering), Transmission lines, Circuits, Waveguides, Coaxial cables, Oscillation.

Successful operation with the reactively loaded inter-digital line has proved more difficult for this program at X-band than it has at lower frequencies. The fourth-order periodicity of the structures, together with the small mechanical dimensions which magnify the effects of tolerances, makes it extremely difficult to obtain a good impedance match. In the absence of a good match, the several hot tubes built to date have evidenced very strong oscillations at the band edges, with no sign of amplification. Work has begun on a new type of slow wave structure, one that is also a fundamental forward wave circuit but which has certain electrical and physical features that make a broad band match relatively straightforward. Hot tubes with this new circuit are presently under construction. (Author)

AD-607 863 Div. 8, 25
OTS Prices: HC $4.00/MF $1.00

Naval Academy, Annapolis, Md.
SOME ELECTRON RADIATION EFFECTS ON TRANSISTORS: A DATA RE-PRESENTATION TECHNIQUE.
Research rept.,
by Leon Preston Brooks, Jr. 5 May 64, 133p
S 5

Unclassified report

A thesis presented as partial fulfillment of the requirements for successful completion of the Trident Scholars Program.

Descriptors: (*Transistors, Electron bombardment), (*Electron bombardment, Transistors), Semiconductor devices, Electron beams, Environmental tests, Test methods, Electric currents, Gain, Switching circuits, Degradation, Circuits, Amplifiers, Computers, Analysis, Graphics, Electronic equipment.

VOLUME 2. MAGNESIUM GERMANIDE.
Final rept.,
by H. Kroemer, G. F. Day, R. D. Fairman, and J. Kinoshita. Oct 64, 63p
Contract AF33 657 11015, Proj. 4460, Task 446001
AL TDR64 258 V2

Unclassified report

See also AD-607 986.

Descriptors: (*Microwave equipment, Solid state physics), (*Semiconductors, Electronic equipment), (*Magnesium alloys, Seimanium alloys), Single crystals, Integrated circuits, Impurities, Crystal growth, Zone melting, Preparation, Electrical properties, Diodes (Semiconductor), Etched crystals, Stability, Antimony, Arsenic, Boron, Sodium, Gold, Metal films, Electric currents, Capacitance, Transients, Encapsulation, Eutectics.

A study was made of the preparation and properties of the new semiconductor Mg2Ge, in order to determine its feasibility and usefulness for electronic devices other than bipolar transistors, particularly for integrated electronics.

AD-607 986 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Varian Associates, Palo Alto, Calif.
SOLID STATE MICROWAVE AND POWER DEVICES. VOLUME 1. INTEGRATED AMPLIFIER.
Final rept.,
by H. Kroemer. Oct 64, 79p
Contract AF33 657 11015, Proj. 4460, Task 446001
AL TDR64 258 V1

Unclassified report

See also AD-607 985.

Descriptors: (*Microwave equipment, Solid state physics), (*Microwave amplifiers, Semiconductor devices), (*Semiconductor devices, Microwave amplifiers), Tunnel diodes, Hall effect, Negative resistance circuits, Impedance matching, Push-pull amplifiers, Switching circuits, Gain, Epitaxial growth, Indium alloys, Antimony alloys, Arsenic alloys, Vacuum apparatus, Vapor ploting, Oscillators, Temperature, Frequency, Integrated circuits.

A study was made of solid-state amplifiers that utilize the negative resistance of tunnel diodes, as an amplifying mechanism, in combination with the non-reciprocity of the Hall-effect. This was achieved by connecting tunnel diodes across either the input or the output of a Hall isolator.

AD-607 988 Div. 8, 12
OTS Prices: HC $3.00/MF $0.75

Physical Science Lab., New Mexico State Univ., University Park.

CIRCULARLY POLARIZED DUAL FREQUENCY FAN BEAM ARRAY AND HEMISPHERICAL COVERAGE ANTENNAS FOR SATELLITE TRACKING.
Final rept.,
by J. H. Diel. 20 Aug 64, 89p CR-14
Contract NOrd16710

Unclassified report

Descriptors: (*Antennas, Tracking), (*Tracking, Satellites), Antennas configurations, Antenna radiation patterns, Polarization, Electric impedance, Dipole antennas, Very high frequency, Ultrahigh frequency, Beams (Electromagnetic), Antenna feeds.

This report contains a description of the work accomplished in connection with the design of two types of satellite tracking antennas, a fixed antenna with hemispherical coverage and left circular polarization, and a preset fan beam array with left circular polarization. The work done included a study of some of the various parameters affecting the shape of the pattern of a turnstile above a ground plane, the polarization of a turnstile above a ground plane and the impedance of a turnstile antenna. In addition, three prototype antennas were designed and built: two single frequency fixed antennas and one dual frequency preset fan beam array. The Appendix describes the method used to establish the location of the electrical phase center. (Author)

AD-607 989 Div. 8
OTS Prices: HC $2.00/MF $0.50

Weston Instruments, Inc., Newark, N. J.
A POROUS SUBSTRATE RESISTOR AIMED AT MINIATURIZATION OF METAL-FILM RESISTORS.
Interim development rept. no. 8, Phase 2, 1 Jun-31 Aug 64,
by T. Matley and R. E. Busch. 31 Aug 64, 29p
Contract NObsr87542, Proj. SR0080303, Task 9636

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Miniature electronic equipment, Resistors), (*Resistors, Miniature electronic equipment), (*Metal films, Resistors), Porous materials, Quartz, Aluminum compounds, Oxides, Electric terminals, Hysteresis, Resistance (Electrical), Thermal conductivity, Metal coatings, Temperature, Brazing, Epoxy plastics.

A comparison of alumina with quartz porous substrates with respect to heat dissipation was inconclusive. The absence of intercommunicating porosity in the central portion of the alumina substrates prevented proper metallization. Temperature gradient data have been found to be very useful in appraising the quality of the terminals nondestructively. A resistance shift (hysteresis) is evident upon electrical loading. The magnitude of the shift is beyond what can be explained by temperature and/or voltage coefficients. Resistance hysteresis is still marked in resistors made from substrates with the most uniform structural properties. (Author)

ESTIMATION OF COMPONENT RELIABILITY USING INFORMATION GATHERED ON THE PARTS LEVEL AND ON THE COMPONENT LEVEL, AN ECLECTIC APPROACH.
Technical Information Series,
by S. Matlin. 20 Mar 61, 34p R61SD54
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from the best available copy.

Descriptors: (*Reliability (Electronics), Determination), Electronic equipment, Statistical analysis, Failure (Mechanics), Life expectancy, Circuits, Redundant components.

This analysis suggests a reasonable procedure for combining two sources of information gathered at any stage of a test program to arrive at an estimate of the reliability of a component. (Author)

AD-607 937 Div. 8
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
THE ANALYSIS OF PHASE DETECTOR PERFORMANCE FOR A SIGNAL PLUS NOISE INPUT,
by Arthur R. kraiman. 11 Jan 61, 63p
STL/TM-61-0000-19008
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Phase detectors, Performance (Engineering)), Signal-to-noise ratio, Oscillators, Diodes, Statistical analysis.

Expressions were derived for the mean and mean square value of the output of a phase detector to which is applied a sinusoidal signal corrupted by narrow-band Gaussian noise, together with an oscillator reference of the same frequency as the signal but displaced in phase. The analysis was based on the model of a balanced phase detector composed of peak-detecting diodes producing a difference output from the two halves. Based on the above output parameters, a measure of phase detector performance was defined in terms of a 'noise-to-noise ratio,' the square root of the output variance without signal divided by the same quantity with the signal present. The case where signal and reference are in quadrature was treated in detail, yielding curves of this ratio under varying input and reference conditions. In addition, the voltage output 'signal-to-noise ratio' was calculated as a function of the phase angle between signal and reference, and the resulting graphs show the effects of reference level and input signal-to-noise power ratio. (Author)

AD-607 945 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Melabs, Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS.
Quarterly progress rept. no. 9, 17 Feb-7 Jul 64,
by Lee F. Donaghey. 7 Jul 64, 21p
Contract DA36 039SC89206, Task 1G6 22001A055 05
Unclassified report

See also AD-438 185.

Descriptors: (*Parametric amplifiers, Ferromagnetic materials), (*Ferromagnetic materials, Parametric amplifiers), Pumping (Electronics), Microwave frequency, Ferrites, Garnet, Oscillation, Electromagnetic properties, Waveguides, Cylindrical bodies, Circuits, Magnetrons.

Recent experimental work in progress on the longitudinally pumped magnetodynamic parametric amplifier is discussed. For one experiment the pump power threshold for oscillation for the amplifier described is as low as 5.5 watts peak using a pulsed mode of pumping. (Author)

AD-607 967 Div. 8
OTS Prices: HC $2.00/MF $0.50

National Co., Inc., Malden, Mass.
PRODUCTION ENGINEERING MEASURE FOR CESIUM BEAM TUBES.
Quarterly progress rept. no. 3, 23 Nov 63-23 Feb 64,
by James George. 23 Feb 64, 32p
Contract DA36 039AMC01457
Unclassified report

See also AD-604 413.

Descriptors: (*Cesium electron tubes, Manufacturing methods), Performance (Engineering), Design, Frequency, Stability, Reliability (Electronics), Quality control, Experimental data.

The tasks performed during this reporting period involved the fabrication, assembly, alignment, and testing of the second two (PEM-E3 and PEM-E4) of six engineering model cesium beam tubes. Preliminary performance data is presented on frequency accuracy and stability as evaluated in an NC1601 Atomichron, with an NC2001 Atomichron used for comparison. The static test data for tubes PEM-E3 and PEM-E4 is presented and compared to that for tubes PEM-E1 and PEM-E2, in order to evaluate design performance. Graphs of various tube parameters are included. The continuation of the reliability and quality control program and the initiation of the quality control manual are described.

AD-607 983 Div. 8
OTS Prices: HC $2.00/MF $0.50

Westinghouse Defense and Space Center, Baltimore, Md.
DEVELOPMENT OF MILLIMETER AND SUBMILLIMETER MASER DEVICES.
Interim technical rept. no. 5, 1 Jun-31 Oct 64,
by W. E. Hughes. 31 Oct 64, 26p WDSC-490E
Contract AF33 657 10472
Unclassified report

See also AD-602 019.

Descriptors: (*Masers, Design), Microwave spectroscopy, Spectrum analyzers, Zinc compounds, Tungstates, Rutile, Aluminum compounds, Oxides, Nitrates, Sapphires, Impurities, Iron, Waveguides, Traveling-wave tubes, Gain, Circuits, X-band.

The major effort was devoted to the construction of a dual-channel millimeter-wave spectrometer, the testing of a Fe3+, ZnWO4 zero-field maser, experiments on a Fe3+, TiO2 zero-field maser, and the construction of X-band maser circuitry. Each of the above program elements are described in detail in the body of the report and the conclusions drawn from the experiments are given. (Author)

AD-607 985 Div. 8, 25
OTS Prices: HC $3.00/MF $0.75

Varian Associates, Palo Alto, Calif.
SOLID STATE MICROWAVE AND POWER DEVICES.

The observed spectral intensity curves were found to be several orders of magnitude greater than those predicted in the analytical phase. The experimental intensities increased toward the red end of the spectrum, whereas the theoretical intensities decreased. These facts, plus the observation of appreciable radiation when using nitrogen as a test gas, indicate that the experimental intensities are due to contaminants in the flow. (Author)

AD-607 508 Div. 9, 1
OTS Prices: HC $5.00/MF $1.00

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
AERODYNAMIC CHARACTERISTICS AND FLAP LOADS FOR A BLUNT PYRAMIDAL CONFIGURATION AT MACH 5 AND 8. PART OF AN INVESTIGATION OF HYPERSONIC FLOW SEPARATION AND CONTROL CHARACTERISTICS,
by William J. Evans and Louis G. Kaufman, II.
Sep 64, 151p
Contract AF33 616 8130, Proj. 8219, Task 821902
FDL TDR64 128

Unclassified report

Descriptors: (*Aerodynamic configurations, Blunt bodies), (*Hypersonic flow, Aerodynamic characteristics), (*Blunt bodies, Hypersonic flow), Flaps, Aerodynamic loading, Delta wings, Swept-back wings, Canard configuration, Angle of attack, Moments, Reynolds number, Control, Model tests.

Six-component force and moment data were obtained for Mach 5 and 8 flows over a blunt pyramidal configuration. The model had a triangular cross section and was composed of two dihedral surfaces and a 70-degree sweepback delta wing lower surface. Three-component force and moment data were obtained on a remotely controlled trailing edge flap at deflections up to 40 degrees. All three surfaces had trailing edge flaps and the model was tested with and without canards and a ventral fin. The model was pitched at angles of attack between ±54 degrees and side-slip angles between -4 and +14 degrees. For both Mach numbers, the data were obtained for a nominal free stream Reynolds number, based on model length, of 4.5 million. Selected configurations were tested at other Reynolds numbers between 1.2 and 9.1 million. (Author)

AD-607 510 Div. 9, 8
OTS Prices: HC $2.00/MF $0.50

Electrical Engineering Research Lab., Univ. of Texas, Austin.
MEASUREMENT OF TOTAL CROSS SECTIONS OF WATER DROPS AT 5 MM WAVELENGTH UTILIZING THE 'SHADOW THEOREM'.
Technical rept. no. 9,
by Kenji Funakawa. 10 Sep 64, 39p
Contract AF33 657 8716, Proj. 4062

Unclassified report

Descriptors: (*Water, Drops), (*Drops, Water), (*Measurement, Drops), Electronics, Integral equations, Mathematical analysis, Scattering, Electromagnetic waves, Attenuation, Test methods, Laboratory equipment, Temperature.

Total 5 mm wavelength cross sections of falling water drops with radii between 1.25 mm and 3.38 mm were measured at two droplet temperature intervals, 25C to 28C and 2C to 5C, using the shadow theorem which relates the imaginary part of forward scattering coefficient to the total cross section. The experimental total cross section values were a little smaller than the theoretical values of the total cross sections of spherical water drops, and the differences between the experimental cross sections of the drops at the two temperatures were comparable to the experimental errors. Measurements were also made of total cross sections of metal spheres with radii between 1.98 mm and 4.35 mm as a preliminary verification of the theorem and were found to be in good agreement with theoretical values. (Author)

AD-607 519 Div. 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
ON THE TRANSFER OF HEAT AND MASS IN THE TURBULENT BOUNDARY LAYER,
by Nicholas Rott. 11 Jul 57, 24p GM-TR-211

Unclassified report

Descriptors: (*Turbulent boundary layer, Transport properties), (*Transport properties, Turbulent boundary layer), Boundary layer, Heat transfer, Compressible flow, Shear stresses, Laminar flow, Reynolds number, Motion, Equations.

This report contains discussions on Reynolds' analogy, the wall shear, blowing, and the wall shear in the turbulent boundary layer with blowing.

AD-607 522 Div. 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE STREAM FUNCTION EQUATION FOR A HIGH-TEMPERATURE GAS IN AXISYMMETRIC ROTATIONAL FLOW,
by H. E. Wohlwill. 23 Dec 57, 18p
STL/GM-TN-0165-00100

Unclassified report

Descriptors: (*Gas flow, Equations), (*High temperature research, Gas flow), Axially symmetric flow, Fluid mechanics, Momentum, Thermodynamics, Partial differential equations, Shock waves, Rotation, Functions.

A stream function equation for a high-temperature gas in axisymmetric rotational flow has been derived by Garabedian using a constant 'gamma' to relate h, rho and p in one equation and the same constant to relate p, S, and rho in another equation. The present derivation avoids such restrictions on the form of the functional relationships between the thermodynamic variables.

AD-607 543 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ESTABLISHING A CONSISTENT COMPRESSION-EXPANSION FORMULA FOR THE SUPERSONIC-HYPERSONIC REGIME,
by Elie Carafoli. 15 Oct 64, 14p
FTD TT64 668; TT 64 71614

Unclassified report

Edited trans. of Academia Republicii Populare Romine. Comunicarile, 1962, v. 12, no. 9, p. 985-993.

Descriptors: (*Supersonic characteristics, Mathematical analysis), (*Hypersonic characteristics, Mathematical analysis), Shock waves, Pressure, Compressive properties, Rumania.

The paper proposes to analyze the expression for the

9. Fluid Mechanics

AD-607 442 Div. 9, 1
OTS Prices: HC $3.00/MF $0.75

Aerospace Corp., Los Angeles, Calif.
SEPARATED FLOW PAST SLENDER DELTA WINGS WITH SECONDARY VORTEX SIMULATION,
by Bernard Pershing. 24 Aug 64, 71p
TDR-269(4560-10)-4
Contract AF04 695 269
SSD TDR64 151

Unclassified report

Descriptors: (*Delta wings, Aerodynamic characteristics), (*Fluid flow, Delta wings), Angle of attack, Vortices, Two-dimensional flow, Lift, Experimental data, Theory, Correlation techniques.

The flow about a slender flat-plate delta wing at angle-of-attack is represented by replacing the vortex core-feeding sheet system associated with leading edge separation by a force-free concentrated vortex. Secondary flow phenomena near the leading edge are approximated by allowing infinite flow velocity around the leading edge. The problem is reduced to a two-dimensional one by assuming a conical field and using slender wing theory. Computed pressure and lift distribution, vortex position, lift coefficient, and flow patterns are compared with test data and with the theories of Brown and Michael, and Mangler and Smith. The nonlinear characteristics of the lift curve with angle-of-attack and the strong influence of secondary flow simulation on vortex position and pressure distribution are displayed. The vortex is shown to be further inboard than predicted by previous theories and to correlate well with experiment. The nonlinear component of lift, the pressure distribution, and surface flow pattern are also shown to correlate well with experiment. (Author)

AD-607 449 Div. 9, 30
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
WATER TUNNEL INVESTIGATIONS OF STEADY STATE CAVITIES.
Progress rept.,
by Phillip Eisenberg and Hartley L. Pond. Oct 48, 26p
DTMB 668; PB 162 856

Unclassified report

Prepared for presentation at Underwater Ballistics Conference (no. 7).
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Cavitation, Water tunnels), (*Water tunnels, Cavitation), Bubbles, Fluid flow, Drag, Fluid dynamic properties, Pressure, Transport properties.

The investigations described are an outgrowth of experiments conducted in connection with the so-called cativation method or analogue for developing forms having specified critical cavitation numbers. This method is based on the definition of critical cavitation number as that corresponding to the minimum pressure coefficient of the body. It is an experimental device by means of which the offsets of a solid body are obtained from 'steady-state' cavitation bubbles formed behind elementary nose or leading-edge shapes placed in a stream. (Author)

AD-607 474 Div. 9
OTS Prices: HC $3.00/MF $0.50

Syracuse Univ., N.Y. Research Inst.
THE WALL-JET IN A LONGITUDINAL PRESSURE GRADIENT.
Annual rept.,
by F. Erian and S. Eskinazi. 31 Oct 64, 53p
ME937-6410F
Contract Nonr669 16

Unclassified report

Descriptors: (*Jets, Fluid dynamic properties), Pressure, Turbulence, Shear stresses, Gas flow, Velocity, Statics, Energy, Wind tunnels, Airfoils.

The objectives of the work are two fold. Firstly, its studies the effect of a longitudinal pressure gradient on the nature of the shear stress distribution, as well as the mechanism of energy-production. Secondly, it explores to find out if the existence of pressure gradients increased, in the flow field, the size of the negative energy-production region. The flow pattern used in conducting the present experiments was composed of a half-jet blowing out of a narrow vertical slot of large aspect ratio. The jet was bounded by a smooth rigid flat wall on one side, and mixing with a slower stream of air on the free side. A convergent then divergent passage was provided for the entire flow by placing a half symmetrical Joukowski airfoil section on the free stream side of the wind tunnel. This airfoil section not only created a longitudinal variation in the free stream velocity, but also a pressure gradient which changed sign from negative in the convergent part of the passage to positive in the divergent part.

AD-607 507 Div. 9, 19
OTS Prices: HC $4.00/MF $0.75

North American Aviation, Inc., Downey, Calif.
ADVANCED CELESTIAL TRACKER TECHNIQUES.
Rept. for Jul 63-May 64,
by Edward P. French, Lloyd P. Le Blanc, and Francis E. Wochna. Aug 64, 108p SID-64-865
Contract AF33 657 10894, Proj. 4200, Task 420002
AL TDR64 127

Unclassified report

Descriptors: (*Hypersonic test vehicles, Wind tunnel models), (*Aerodynamic heating, Hypersonic flow), (*Celestial guidance, Hypersonic flight), Nose cones, Blunt bodies, Star trackers, Infrared radiation, Thermal radiation, Gas flow, Shock waves, High temperature research, Boundary value problems, Absorption spectrum, Spectrum analyzers, Molecular spectroscopy.

This report includes the results of ten months of study, with the objective to evaluate spectral radiation intensities from the shock and boundary layers associated with a hypersonic vehicle. The intended application is to predict the amount of radiant energy reaching the sensing element of a celestial tracker. The analytical phase of the study consisted of numerical solutions of the viscous and inviscid flow equations and the correlation of flow field properties in terms of readily available flight and vehicle parameters. The flow properties, in turn, were used to compute theoretical values of spectral intensity. The intensities were in turn correlated in the form of easy-to-use charts and equations. The experimental phase consisted of the measurement of absolute spectral intensities from the conical portion of blunt cone models in a hypersonic wind tunnel. A scanning spectrometer was built and used to obtain multiple frequency scans, each lasting about five milliseconds, at two locations in the flow field.

by G. F. Carrier. 8 Aug 58, 14p
STL/GM-TM-0165-00268

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Aerodynamic heating, Ablation), (*Ablation, Thermodynamics), Superaerodynamics, Blunt bodies, Melting, Boundary layer, Gas flow, Liquids, Mathematical prediction.

When a blunt axially symmetric object is exposed to a sufficiently high speed air stream, the air behind the shock has a very high enthalpy and the object will melt. In order to compute the rate of melting, or any other macroscopic features of the composite flow, both the gas boundary layer flow and the melting body flow must be analyzed. This analysis can most conveniently be carried by (1) assuming an interface temperature, Ti, (2) predicting the gas boundary layer associated with that Ti, (3) predicting the liquid layer flow using as boundary conditions the results of step (2), and (4) selecting the correct Ti as that value which leads to a consistent energy balance. This note contains an analysis of the liquid layer flow for a given, quite general, family of material properties. The interface temperature, Ti, the skin friction at the interface, the evaporation rate at the interface, and the pressure gradient, are taken as known quantities since the latter three items are controlled by the gas layer and are known once Ti is given. (Author)

AD-607 611 Div. 9
OTS Prices: HC $3.00/MF $0.75

United Aircraft Corp., East Hartford, Conn.
EXTERNAL DRAG OF DUCTED BODIES CONSISTING OF CONE FRUSTUMS AND CONE FRUSTUMS FOLLOWED BY CYLINDERS MOVING AT SUPERSONIC SPEEDS,
by Isaac Greber. 12 Jan 53, 68p R-12002-40

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Ducted bodies, Drag), (*Drag, Ducted bodies), Cylindrical bodies, Conical bodies, Engine nacelles, Supersonic flow, Aerodynamic characteristics, Mathematical analysis, Graphics.

The linearized theory is here applied to the determination of the wave drag of ducted cones of lip angles 1 to 12 degrees moving at supersonic speeds, M = 1.2 to 4.0, and at zero angle of attack. The results are presented as graphs of wave drag coefficient based on maximum frontal area versus ratio of maximum frontal area to inlet area, a family of constant Mach number curves being drawn for each lip angle. It will be noted that the range of calculated results exceeds the limits of validity of linearized theory. Therefore the use of the curves for the higher Mach numbers, say above 2.5, and larger lip angles, say greater than 6 degrees is advised only in the absence of more accurate data. In order to make the use of this report more convenient for total external drag calculations, curves are presented of turbulent skin friction coefficient based on total surface area versus the product of total body length and Mach number, with altitude as a parameter. A conversion chart is given to convert the coefficient based on surface area to one based on maximum frontal area, and a method is shown for calculating the total drag coefficient based on maximum frontal area of a ducted body consisting of a conical nose and a cylindrical afterbody, essentially a power plant nacelle configuration. (Author)

AD-607 618 Div. 9
OTS Prices: HC $6.00/MF $1.50

Republic Aviation Corp., Farmingdale, N. Y.
RESEARCH INVESTIGATION OF HYDRAULIC PULSATION CONCEPTS.
Final rept. for 15 Feb 63-15 Aug 64.
Oct 64, 271p
Contract AF33 657 10622, Proj. 8128, Task 812807
APL TDR64 109

Unclassified report

See also AD-600 663.

Descriptors: (*Hydraulic systems, Fluid flow), Oscillation, Hydraulic models, Fluid dynamic properties, Analog computers, Mathematical models, Mechanical drawings, Feasibility studies.

This final report covers a program during which Republic made a research investigation of the technical feasibility of the transmission and utilization of hydraulic power through the use of pulsating pressure or pulsating flow concepts. It was concluded that the pulsating flow means were suitable for power transmission, whereas pulsating might be adapted for signal transmission. The type of system currently in greatest use in aerospace vehicles is the constant pressure flow demand system that utilizes a pressure-compensated variable delivery pump. Republic believes that an adaptation of this system to the requirements of a pulsating system will produce the most desirable means of control from the standpoints of efficiency, simplicity, and reliability. Our major efforts have therefore been concerned with the design of such an adaptation. The research investigation was carried on by two methods: (1) the design effort, and (2) the analytical method. The laboratory effort was limited to relatively simple experiments intended to verify or facilitate analytic results. The system analysis was augmented and verified by data derived from a miniaturized pulsating hydraulic system. As a result of its research investigation, Republic recommends that the effort be continued and that a representative operating pulsating system be investigated to confirm the analytic data and that further investigations be made into the applicability of pulsating hydraulic concepts for vehicular use.

AD-607 624 Div. 9
OTS Prices: HC $4.00/MF $0.75

Aerospace Corp., Los Angeles, Calif.
HARMONIC GUST AERODYNAMIC INFLUENCE COEFFICIENTS FROM INCOMPRESSIBLE STRIP THEORY: ANALYTICAL DEVELOPMENT AND COMPUTATIONAL PROCEDURE,
by William P. Rodden, Edith F. Farkas, and Heather A. Malcom. 15 Sep 62, 108p TDR-169(3230-1) TN-4
Contract AF04 695 169
SSD TDR62 87

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Subsonic flow, Aerodynamic characteristics), (*Gust, Subsonic characteristics), Incompressible flow, Two-dimensional flow, Airfoils, Oscillation, Mathematical analysis, Programming (Computers), Punched cards.

A method is presented for computing the aerodynamic influence coefficients (AICs) for a surface traveling at subsonic speed through an oscillatory gust field. The method is based on a fundamental solution of unsteady flow theory that of Sears for a two-dimensional airfoil traveling through a harmonic gust field in an incompressible fluid. The

pressure coefficient at large angles of incidence to establish a consistent formula for supersonic-hypersonic regimes, and, under certain conditions, for the impact (Newtonian) regime.

AD-607 548 Div. 9, 10, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DIGITAL PROGRAM FOR FLUID SLOSHING IN TANKS WITH AXIAL SYMMETRY,
by J. L. Hieatt and J. D. Riley. 30 Sep 59, 22p
STL/TM-59-0000-00389

Unclassified report

Descriptors: (*Sloshing, Fuel tanks), (*Guided missiles, Dynamics), Digital computers, Programming (Computers), Mathematical analysis, Control systems, Geometric forms.

In the analysis and design of missile control systems, it is necessary to describe the various dynamic phenomena which contribute to over-all system performance. The sloshing of fuel in missile tankage is one of the necessary dynamic considerations. The purpose of the report is to describe a digital computer routine employed for the determination of the effect of fluid sloshing on missile dynamics. An outline was prepared in order to facilitate the use of this computer program. A summary in part of the results obtained in a theoretical study of sloshing precedes a description of the computer solution. In conclusion an outline is presented for the preparation of information needed for computer solution of the sloshing problem, accompanied by an example input data sheet. (Author)

AD-607 573 Div. 9
OTS Prices: HC $5.00/MF $1.00

Stanford Univ., Calif. Div. of Engineering Mechanics.
COMPUTATION OF THE LAMINAR COMPRESSIBLE BOUNDARY LAYER,
Final rept. for May 63-Jun 64,
by Irmgard Flugge-Lotz. Jun 64, 155p
Grant AF AFOSR235 63
AFOSR 64 1628

Unclassified report

Descriptors: (*Laminar boundary layer, Compressible flow), (*Hypersonic flow, Mathematical analysis), Blunt bodies, Axially symmetric flow, Cylindrical bodies, Vortices, Difference equations, Viscosity.

First-and second-order boundary-layer theory are examined in detail for some specific flow cases of practical interest. These cases are for flows over blunt axisymmetric bodies in hypersonic high-altitude (or low density) flow where second-order boundary-layer quantities may become important. These cases consist of flow over a hyperboloid and a paraboloid both with free-stream Mach number infinity and flow over a sphere at free-stream Mach number 10. The method employed in finding the solutions is an implicit finite-difference scheme. It is found to exhibit both stability and accuracy in the examples computed. The method consists of starting near the stagnation-point of a blunt body and marching downstream along the body surface. (Author)

AD-607 579 Div. 9
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME PROBLEMS OF FLOW, HEAT TRANSFER, AND DIFFUSION IN THE LAMINAR FLOW ALONG A FLAT PLATE,
by H. Schuh. 20 Feb 49, 24p T-15
TT 64 71610

Unclassified report

Trans. of unidentified Austrian mono. n.p., n.d.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Laminar boundary layer, Mathematical analysis), (*Heat transfer, Laminar boundary layer), (*Diffusion, Laminar boundary layer), Velocity, Temperature, Fluid flow, Flat plate models, Iterative methods, Integral equations, Austria.

Following closely E. Polhausen's solution for the laminar temperature field at the flat plate in longitudinal flow, formulas are derived which permit calculation of the velocity and temperature field for variable properties by means of an integral equation and an iteration method based on this equation. Accordingly, the following cases were solved: By assuming that only viscosity varies with temperature and that the remaining properties are constant, the velocity and temperature fields were calculated for the Pr numbers 12.5 and 100 (viscous fluids) at heated and cooled plate conditions. (Author)

AD-607 596 Div. 9
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
CONES IN SUPERSONIC FLOW,
by W. Hantzsche and H. Wendt. 5 Jan 48, 47p T-8
TT 64 71621

Unclassified report

Trans. of mono. Mit Uberschallgeschwindigkeit Angeblasene Kegelspitzen, n.p., n.d.

Descriptors: (*Conical bodies, Supersonic flow), (*Supersonic flow, Conical bodies), Axially symmetric flow, Shock waves, Compressive properties, Differential equations, Numerical analysis, Graphics.

For the treatment of a supersonic flow over a wedge, it is particularly suitable to employ the so-called shock polar diagram which summarizes all velocities appearing in flows with compression shocks. In the corresponding axial case of supersonic flow over cones (which is very important in ballistics), an adiabatic compression takes place in the conical field extending from the compression shock to the surface of the cone. The velocities appearing in this case on the surface of the cone are found on the line which encloses the shock polars. Let this line be called the Apfel curve, a diagram of which was published recently by Busemann. For an exact analysis of supersonic flows over cones, however, it is necessary to know the curves corresponding to the adiabatic compression which connect the shock polars and the Apfel curves. These curves are presented in the report. They are determined by a graphical-numerical integration of the differential equation of the axially symmetrical conical field in the hodograph for all cone angles and for all free-stream velocities. The pressures on the surface of the cone thus obtained are represented in diagrams and compared with the two-dimensional case.

AD-607 606 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
AERODYNAMIC HEAT TRANSFER TO A MELTING BODY,

AND TURBULENT BOUNDARY LAYER AROUND TWO-DIMENSIONAL AND AXISYMMETRIC BODIES WITH SUCTION OR BLOWING.
Research rept. no. 50,
by Hideki Yamaoka. Sep 64, 56p
Contract DA44177AMC892T, Task 1D121401A14203
TRECOM TR64 44

Unclassified report

Descriptors: (*Laminar boundary layer, Mathematical analysis), (*Turbulence, Boundary layer), Axially symmetric flow, Two-dimensional flow, Incompressible flow, Momentum, Lift, Drag, Equations, Thickness.

Imcompressible fluid of steady flow around two-dimensional and axisymmetric bodies is assumed. Method of calculation for the laminar and turbulent boundary layer momentum thickness with arbitrarily distributed suction or blowing is developed, starting from the energy theorem instead of the momentum theorem. By giving proper form for the suction or blowing velocity distribution, momentum thickness is expressed by the summation of two terms, one given for the impervious case and the other produced by the existence of suction or blowing velocity distribution on the surface of the body. For the evaluation of the impervious term, Truckenbrodt's method is used. As examples of the application of the method, an elliptic cylinder for a two-dimensional case and a spheroid for an axisymmetric case of fineness ratio 0.3 are used for both laminar and turbulent cases. (Author)

AD-607 695 Div. 9, 30
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ARC HEATING TECHNIQUES FOR A SHOCK TUBE DRIVER,
by Lawrence Y. Lamb. Jun 60, 38p
STL/TN-60-0000-09145

Unclassified report

Descriptors: (*Shock tubes, Heaters), (*Electric arcs, Shock tubes), Feasibility studies, Gases, Heating, Thermodynamics, Helium, Air, Shock waves.

A study of the feasibility of arc heating as a means of increasing the sound speed in the driver gas in a shock tube was made. The facilities and the equipment used for the experiments are described, as are the operational procedures. The arc unit and its characteristics were investigated, and the results of the experiments with the arc heated shock tube are described. (Author)

AD-607 727 Div. 9, 25
OTS Prices: HC $5.00/MF $1.00

Stanford Univ., Calif.
SPOT COOLING AND HEATING OF SURFACES WITH HIGH VELOCITY IMPINGING AIR JETS. PART 2. CIRCULAR JETS ON PLANE AND CURVED SURFACES, SLOT JETS ON CURVED SURFACES.
Technical rept. no. 61,
by Dieter Richard Walz. Jul 64, 161p
Contract Nonr225 23, Proj. NR090 342

Unclassified report

Descriptors: (*Jets, Heat transfer coefficients), (*Thermodynamics, Jets), Aerodynamic heating, Cooling, Surfaces, Axially symmetric flow, Nozzles, Aerodynamic slots, Heat transfer, Fluid flow, Experimental data, Targets.

Average heat transfer coefficients were determined experimentally for small, high velocity air jets impinging normally on flat and curved surfaces. Jets of both circular and flat rectangular (slot) cross-sections were used. The transient temperature response of the copper target, forming the surfaces in question, was used to deduce the convective heat transfer coefficient. The reduced data are given in nondimensional form to maintain generality and to allow application to other geometrically similar configurations and for fluids other than air. (Author)

AD-607 733 Div. 9, 4
OTS Prices: HC $4.00/MF $1.00

Douglas Aircraft Co., Inc., Long Beach, Calif.
GENERAL METHOD FOR SOLVING NONEQUILIBRIUM LAMINAR-BOUNDARY-LAYER FLOW OF A BINARY GAS,
by Darwin W. Clutter, A. M. O. Smith, and N. A. Jaffe.
15 Oct 64, 140p LB-31616
Contract NOw60 0533c

Unclassified report

Descriptors: (*Hypersonic flow, Laminar boundary layer), (*Laminar boundary layer, Mathematical analysis), (*Nonequilibrium flow, Laminar boundary layer), Dissociation, Reaction kinetics, Catalysis, Differential equations, Integration, Flat plate models, Blunt bodies, Conical bodies, Stagnation point, Transport properties, Programming (Computers), Atmosphere entry.

The purpose of the project was the development of an accurate method for solving the complete equations of dissociated laminar-boundary layer flow of a binary gas in chemical nonequilibrium. The primary concern was the mathematical solution rather than the physics and chemistry of the flow processes. The method of solution consists of replacing the partial derivatives with respect to the flow direction by finite differences, while retaining the derivatives in a direction normal to the boundary, so that the partial differential equations become approximated by ordinary differential equations. The ordinary differential equations are solved simultaneously at a given station in the flow direction as the calculation proceeds downstream. The method was programmed for an IBM 7094 computer for the special case of air treated as a single gas, and solutions for a variety of flows are presented. Results are shown for nonsimilar flows at velocities up to Mach 25 for various wall temperatures and amounts of dissociation. Effects of chemical-reaction rates, wall catalyticity, and various fluid-property relations are shown.

AD-607 807 Div. 9, 15
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
NUMERICAL STUDY OF THE NAVIER-STOKES EQUATIONS FOR THE PRODUCTION OF SMALL EDDIES FROM LARGE ONES,
by P. C. Jain. Jul 64, 44p MRC-TSR-491
Contract DA11 022ORD2059

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Partial differential equations, Motion), (*Turbulence, Partial differential equations), Vortices, Reynolds number, Numerical analysis, Numerical methods and procedures, Fluid flow, Mathematical models, Difference equations.

To investigate the process of grinding down of large eddies into smaller ones at high Reynolds Numbers, a finite difference method is used to obtain the periodic

harmonic gust AICs relate the aerodynamic control point forces to the spanwise variation of the gust amplitude. The Aerospace IBM 7090 Computer Program No. HM02 provides the gust AICs in printed and optional punched-card output formats. The program capacity is 100 surface strips and 100 values of reduced velocity. (Author)

AD-607 626 Div. 9
OTS Prices: HC $2.00/MF $0.50

General Dynamics/Convair, San Diego, Calif.
AERODYNAMIC HEATING USING THE REAL PROPERTIES OF AIR BEHIND SHOCK WAVES,
by R. K. Livett and G. H. Schadt. 23 Dec 58, 40p
ZR-658-024

Unclassified report

Descriptors: (*Shock waves, Aerodynamic heating), (*Aerodynamic heating, Shock waves), Heat transfer, Hypersonic flight, Aircraft, Surface temperatures, Geometric forms, Programming (Computers), Equations.

The report discusses the development of a procedure for determining flow properties behind conical and oblique shocks which has a short computation time. This was accomplished by curve fitting shock properties. The necessity of using real gas properties in determining post shock properties is illustrated by comparing the real gas solutions to the perfect gas solutions. In addition the effect of using real versus perfect shock gas properties in determining heat transfer is illustrated by comparing equilibrium skin temperatures computed using the two different post shock property solutions. From this study it was found that though there is considerable difference between real and perfect gas shock properties, this difference is not sufficient to cause large differences in equilibrium surface temperatures.

AD-607 631 Div. 9
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE EXPANSION OF RAREFIED GAS INTO A VACUUM,
by P. Molmud. 28 Nov 58, 26p

Unclassified report

Descriptors: (*Gas flow, Vacuum), (*Vacuum, Gas flow), Spheres, Gases, Exhaust gases, Molecular properties, Low-pressure research, Equations of state, Reflectors, Fluid mechanics.

The expansion of an initially uniform gas sphere into a vacuum is described. The analysis proceeds on the basis of free molecular flow. It is demonstrated that collisions will not seriously modify the expansion process as long as the initial mean free path of a molecule within the sphere is much greater than the initial diameter of the sphere. Expressions are derived for the momentum and energy flow associated with the expansion of such a sphere. The expansion of a gas which fills half space and also of a gas initially of the form of a uniform cylinder are described. The interaction of an expanding gas cloud with a specularly reflecting surface is determined. The interaction of an expanding gas cloud with a diffusely reflecting surface is considered. (Author)

AD-607 641 Div. 9, 15
OTS Prices: HC $3.00/MF $0.75

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
FLOW PAST A CIRCULAR CYLINDER WITH A DETACHED SHOCK WAVE,
by O. M. Belotserkovskii. 30 Sep 59, 66p
RAD-9-TM-59-66
Contract AF04 647 305, Proj. WS107A2
TT 64 71620

Unclassified report

Trans. of Vychislitel'naya Matematika (USSR) 1958, no. 3, p. 149-185.

Descriptors: (*Supersonic flow, Cylindrical bodies), (*Gas flow, Differential equations), Partial differential equations, Hypersonic flow, Bodies of revolution, Boundary layer, Superaerodynamics, Shock waves, Equations, Functions, Graphics, Tables, USSR.

The general method of Dorodnitsyn, for integrating first-order partial differential equations of mixed type, is applied to calculate the flow of a uniform supersonic or hypersonic stream past a circular cylinder. Using polar coordinates referred to the center of the cylinder, the equations of motions are reduced to an approximating system of ordinary differential equations in the angular coordinate, by prescribing the variation of key dependent variables with radial distance. In the first approximation this variation is linear, in the second approximation it is quadratic and so on. The boundary conditions applied to the ordinary differential equations are given by symmetry conditions and conditions that certain equations pass smoothly through singularities near the sonic line. Flow of a perfect gas past a circular cylinder is calculated for free-stream Mach numbers of 2.13, 2.5, and 4.0 using the first and second approximations, and for free-stream Mach numbers of 3.0 and 5.0 using the first, second, and third approximations. Results show excellent agreement with experimental data. The method can be extended to calculate the flow of a nonperfect gas past cylinders or bodies of revolution of general shape. (Author)

AD-607 643 Div. 9, 15
OTS Prices: HC $2.00/MF $0.50

Brown Univ., Providence, R. I.
THE METHOD OF FUNCTIONALS IN TURBULENCE THEORY,
by Iwao Hosokawa. May 64, 40p WT(BU)-41
Contract AF49 638 1295
AFOSR 64 1396

Unclassified report

Descriptors: (*Turbulence, Functions), (*Functions, Turbulence), Incompressible flow, Mathematical analysis, Statistical processes, Probability, Equations, Partial differential equations, Stochastic processes, Fourier analysis, Boundary layer, Integration, Theory.

The paper consists of two parts. Part I deals with a formulation of the generalized characteristic functional for random fields. This formulation is a generalization of the theory of Hopf so as to include space- as well as time-correlations of the fields. At the same time, it is shown that the Gaussian functional solution can exist also for our generalized characteristic functional as a counterpart of Hopf's solution for incompressible, inviscid Navier-Stokes turbulence. In Part II a general solution is constructed by superposition of the particular solution, slightly modified from what has been found in Part I. Accordingly, the expression for the solution is in terms of a functional integration.

AD-607 655 Div. 9
OTS Prices: HC $3.00/MF $0.50

Mississippi State Univ., State College.
A METHOD FOR THE CALCULATION OF THE LAMINAR

Mathematical analysis, Compressible flow, Electrical conductance, Electromagnetic fields, Aircraft, Control systems.

A uniform steady flow of compressible fluid of low electrical conductivity past thin magnetized bodies was studied. Because of the thinness of the body and the small electrical conductivity of the fluid, the fundamental equations of magnetogasdynamics may be linearized. The external electromagnetic fields are under the control of the designer of the aircraft and independent of the flying conditions. Hence we may use the electromagnetic fields as a control device for the aircraft flying in a fluid of low electrical conductivity. The effectiveness of this device is proportional to the magnetic parameter R sub M. (Author)

AD-607 867 Div. 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo-Wooldridge, Inc., Los Angeles, Calif.
NOTE ON THE STABILIZING EFFECT OF CENTRIFUGAL FORCES ON THE LAMINAR BOUNDARY LAYER OVER CONVEX SURFACES,
by Lester Lees. 14 Dec 56, 6p GM-TR-118
Contract AF18 600 1190
Unclassified report

Descriptors: (*Laminar boundary layer, Stability), (*Centrifugal fields, Stabilization systems), Supersonic flight, Blunt bodies, Convex bodies, Surfaces, Momentum, Gas flow, Acceleration, Density, Cooling.

At high supersonic flight speeds or with a highly cooled surface, there is a strong density gradient across the boundary layer. Close to the surface the gas is cool and of low-temperature molecular weight; at the outer edge of the boundary layer the gas is hot and may be partially dissociated, so that its density is lower by a factor of 10 - 20. At the same time a strong centrifugal acceleration is produced by the body curvature, and this outward acceleration acts in the direction of decreasing density. The question arises as to whether this destabilizing effect of the acceleration field in a density gradient is sufficient to overcome the stabilizing effect of the increasing angular momentum of the fluid in the outward direction. The conclusion is drawn that the strong stabilizing effect of the outward increase in angular momentum is always dominant in the laminar boundary layer. (Author)

AD-607 868 Div. 9
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo-Wooldridge, Inc., Los Angeles, Calif.
THE EFFECT OF AN INTERNAL COMPRESSIBLE FLUID COLUMN ON THE BREATHING VIBRATIONS OF A THIN, PRESSURIZED, CYLINDRICAL SHELL,
by J. G. Berry and E. Reissner. 24 May 57, 50p
RW-EM-7-5, GM-Tr-180
Contract AF18 600 1190
Unclassified report

Descriptors: (*Structural shells, Vibration), (*Vibration, Compressible flow), Fluid dynamic properties, Oscillation, Frequency, Pressure vessels, Compressive properties, Elasticity, Deformation, Numerical analysis, Tables, Liquids.

Consideration is given to the determination of the inertia and compressibility effects of an internal liquid or gas column on the breathing vibrations of thin, pressurized, circular cylindrical shells. Breathing vibrations are those vibrations of the points of the cylinder walls which correspond to radial deformations proportional to cos ntheta or sin ntheta, where the integer n has at least the value 2. The report contains a discussion of the equations for transverse vibrations of pressurized, shallow cylindrical shells and gives a formula for the frequencies of free vibrations. This formula includes a term for an apparent inertia of the shell walls due to the presence of an internal fluid. The equations for the small motion of an inviscid, compressible, circular cylindrical, fluid column are discussed. The surface of the fluid column is assumed to be acted upon by a pressure which is a function of the axial and circumferential space coordinates and time. The natural frequencies of the elastic cylinder-internal fluid system are also discussed. (Author)

AD-607 869 Div. 9, 10, 12
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
FLUID SLOSHING IN TANKS OF ARBITRARY SHAPE,
by N. W. Trembath. 28 Aug 57, 34p GM45.3-378
Unclassified report

Descriptors: (*Sloshing, Propellant tanks), (*Fuel tanks, Sloshing), Mathematical models, Geometric forms, Motion, Differential equations, Mathematical analysis, Liquid rocket propellants, Guided missiles (Surface-to-surface).

It is the purpose of the analysis presented in this memorandum to develop a mathematical model for the response of tanks of arbitrary shape. The undertermined coefficients of this model may be determined in many cases by numerical means and in all cases by a limited number of experimental measurements. The results are similar in form to the results of a general analysis of bending. The form of the differential equations for the dynamic effects of bending can be specified to within a number of undetermined coefficients. These coefficients may be evaluated by solution of well-specified boundary value problems or by direct measurement. (Author)

AD-607 871 Div. 9
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MOTION OF CONICAL PENDULUM,
by J. V. Howell. 20 Nov 57, 37p GM42.4-4
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Sloshing, Mathematical models), Conical bodies, Motion, Force (Mechanics), Fuel tanks, Mathematical analysis.

The motion of a conical pendulum has been studied by means of an analog computer simulation. The pendulum was excited by motion of the attachment point due to the application of a sinusoidal forcing function. Also the pendulum was initially displaced in the plane perpendicular to the direction of the forcing function. A damping ratio of 3% to 5% was used in order to attain a steady state frequency response record in a reasonable amount of computing time. Equations of motion and other formulae are given. (Author)

AD-607 872 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
A NOTE ON THE CONICAL PENDULUM ANALOGY TO ROTARY SLOSHING.

solutions of the Navier-Stokes Equations numerically when the initial motion is assumed to be v sub 1 = cos x sin y sin z; v sub 2 = - sin x cos y sin z; v sub 3 = 0. Mean square kinetic energy and mean square vorticity are calculated and it is found that the numerical method provides estimates of these quantities up to t = 1.90 at R = 200 and up to t = 1.70 at R = 1000. (Author)

AD-607 811 Div. 9, 12
OTS Prices: HC $3.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
PARTICLE TRAJECTORY PROGRAM FOR RE-ENTRY VEHICLE FLIGHT TEST DATA PROCESSING,
Technical information series,
by M. A. Martin and F. DeMarco. Aug 59, 72p
R59SD405
Contract AF04 647 269

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Reeentry vehicles, Flight testing), (*Particle trajectories, Programming (Computers)), (*Programming (Computers), Particle trajectories), Atmosphere entry, Angle of attack, Aerodynamics, Geometry, Numerical analysis.

Contents:
Geometric equations
Dynamic equations
Special features
Numerical values of certain constants
Tables for atmosphere program
Computer program characteristics
Flow chart of particle trajectory for reentry vehicle flight test data processing.

AD-607 815 Div. 9
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A COLLECTION OF INFORMATION ON SHOCK SPECTRUM OF A LINEAR SYSTEM,
by M. V. Barton, V. Chobotov, and Y. C. Fung.
Jul 61, 56p STL/EM-11-9

Unclassified report

Descriptors: (*Shock (Mechanics), Linear systems), Mechanical waves, Loading (Mechanics), Graphics, Bibliographies.

This is a collection of definitions and charts of the response spectra for a one-degree-of-freedom linear system subjected to shock loading. Available numerical results are collected together and illustrated graphically. Analytical results are not reproduced, but references to convenient sources are given. (Author)

AD-607 816 Div. 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
EQUATIONS OF MOTION FOR THE VARIABLE MASS SPINNING BODY,
by William T. Thomson. Jan 61, 16p
STL/TM-61-0000-19006, STL/EM-11-1

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Motion, Equations), (*Equations, Spin), Particles, Center of mass, Momentum, Transport properties, Moments, Partial differential equations.

The motion of a body under translation and rotation is examined from the point of view of a system of particles having relative motion between particles, leading to a varying configuration, and undergoing a change in mass with time, where constrainis may be imposed on certain numbers of particles. Such a procedure accounts for every conceivable configuration of the system and the possibility of omitting terms in the equations of motion are minimized. The equations can be regrouped to indicate contributions of the more familiar terms, such as rigid body, jet ejection, center of mass shift, and relative motion.

AD-607 831 Div. 9, 25
OTS Prices: HC $3.00/MF $0.75

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
SURVEY OF THEORETICAL AND EXPERIMENTAL DETERMINATION OF SKIN FRICTION IN COMPRESSIBLE BOUNDARY LAYERS. V. THE EFFECTS ON SLIP FLOW,
Technical Information Series,
by D. N. Nestler. 1959, 75p R59SD343
Contract AF04 647 269

Unclassified report

Descriptors: (*Aerodynamic characteristics, Boundary layer), (*Boundary layer, Aerodynamic characteristics), (*Friction, Boundary layer), Theory, Experimental data, Surface properties, Heat transfer, Compressible flow, Geometric forms, Flat plate models, Hemispherical shells, Wedges, Shock waves, Thermodynamics, Hypersonic characteristics, Mathematical analysis.

This report presents the results of a survey of theoretical and experimental determinations of the effect of slip flow on skin friction and heat transfer. Both the theoretical and experimental results indicate that for a given axial pressure gradient, slip effects can be correlated as a function of the local Knudsen number based on boundary layer thickness. An approximate method of estimating slip effects is suggested for practical flight shapes having axial pressure gradients. Quantitative evaluation of slip effects for a flat plate and a hemisphere in hypersonic high altitude flight indicates that slip effects are overshadowed by other low density effects such as transverse curvature and viscous interaction between the shock wave and boundary layer.

AD-607 843 Div. 9, 25
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
LINEARIZED THEORY OF AIRFOILS IN FLUIDS OF LOW ELECTRICAL CONDUCTIVITY.
Technical Information Series,
by S. I. Pai. Dec 59, 31p R60SD311
Contract AF04 647 269
PB 147 298

Unclassified report

Presented at the Smyposium on Engineering Aspects of Magnetohydrodynamics at the University of Pennsylvania, February 18 and 19, 1960.

Descriptors: (*Airfoils, Magnetohydrodynamics), (*Magnetohydrodynamics, Gas flow), Linear systems,

Descriptors: (*Condensation trails, Gas flow), (*Exhaust gases, Rockets), Fluid dynamic properties, Thermodynamics, Jet mixing flow, High altitude, Shock waves, Continuum mechanics, Chemical properties, Electrical properties, Plasma medium, Equations, Velocity.

The report describes methods for calculation of the velocities and thermodynamic properties of flow fields through and around high altitude rocket plumes. The main effort is directed at obtaining a good representation of both the jet flow from rocket motors and the shock-mixing layers in the frontal regions; the calculation then proceeds downstream using standard methods. A comparison with available observations shows good agreement with overall plume dimensions as determined by the flow-field analysis. It may be concluded that the analysis provides a sound gas-dynamic description which may be used as a basis for investigation of the plasma and chemi-electric properties of high altitude plumes. (Author)

AD-607 956 Div. 9
OTS Prices: HC $2.00/MF $0.50

Fluid Dynamics Research Lab., Mass. Inst. of Tech., Cambridge.
LOCAL INSTABILITY OF HYDRODYNAMIC CAVITIES,
by Chang-Yi Wang. Dec 63, 43p FDRG-63-4
Contract Nonr1841 81, Proj. S R009 01 01
Unclassified report

Descriptors: (*Bubbles, Stability), (*Hydrodynamics, Cavitation), (*Hydrofoils, Cavitation), Gravity, Density, Evaporation, Surface tension, Mathematical models, Mathematical analysis, Fluid dynamic properties, Laminar flow.

The Kelvin-Helmholtz-Taylor combined stability criteria is deduced for the cavity walls formed by supercavitating hydrofoils. The effects of gravity, density ratio, cavitation number and evaporation are discussed. Surface tension and centrifugal forces are also taken into consideration. (Author)

AD-607 962 Div. 9
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE EXPANSION OF A GAS CLOUD INTO A VACUUM,
by W. G. Strang and I. Tarnove. 5 Jan 60, 32p
STL/TR-60-0000-00009
Unclassified report

Rept. includes Part I: Solution of the Lagrangian Equations by Separation of Variables, by I. Tarnove and W. G. Strang. Part II: Numerical Solution of the Eulerian Gas Expansion Equations, by W. G. Strang.

Descriptors: (*Gas flow, Vacuum), (*Vacuum, Gas flow), (*Numerical analysis, Gas flow), Superaerodynamics, Pressure, Density, Molecules, Continuum mechanics, Fluid mechanics, Spheres, Dynamics, Equations of state, Gases, Integration, Partial differential equations, Space environmental conditions.

AD-607 970 Div. 9
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVESTIGATION OF A HYPERSONIC FLOW OF SLIGHTLY RAREFIED VISCOUS GAS AROUND A FLAT PLATE,
by V. S. Galkin. 24 Jul 63, 11p
FTD MT63 52; TT 64 71654
Unclassified report

Machine trans. of Akademiya Nauk SSSR, Izvestiya. Mekhanika i Mashinostroenie, 1961, no. 3, p. 18-21.

Descriptors: (*Flat plate models, Hypersonic flow), (*Drag, Flat plate models), Boundary layer, Laminar boundary layer, Gas flow, Thermal insulation, Viscosity, USSR.

Calculation of drag coefficient of a flat semi-infinite heat-insulated plate in a hypersonic gas flow with slip is described. It is assumed that the region of flow between joined strong jumps of the packing and the plate consists of a non-viscous zone and laminar boundary layer. The strong interaction of the jump with the layer is considered. In calculation of the boundary layer the integral form of equation of pulses with linear profile of speed is used and taking into account the speed of slip. Parameters of flow on the external boundary of the boundary layer are calculated by the method of tangential wedges.

AD-607 973 Div. 9, 10
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ABOUT THE WIDTH OF THE ZONE OF BURNING OF A STATIONARY FLAME JET IN TURBULENT FLOW OF UNIFORM MIXTURE,
by A. V. Talantov. 7 Apr 64, 20p
FTD MT63 248; TT 64 71655
Unclassified report

Edited machine trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Aviatsionnaya Tekhnika (USSR) 1961, no. 2, p. 147-157.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Combustion chambers, Jet flames), (*Jet flames, Combustion chambers), Turbulence, Velocity, Fluid flow, Flame propagation, USSR.

The paper represents a comment in connection with the article of K. P. Vlasov, 'Concerning the calculation of the simplest combustion chamber', IVUS, 'Aviation technology', No. 1, 1960. The problem is reworked taking into consideration the dependance of the dimensions of the zone of burning on the normal speed and parameters of turbulence.

AD-607 974 Div. 9, 1
OTS Prices: HC $3.00/MF $0.50

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
SUPERVENTILATED FLOW PAST DELTA WINGS,
by Taras Kiceniuk. Jul 64, 51p E-101.5
Contract N123 60530 34767A
Unclassified report

Descriptors: (*Delta wings, Cavitation), (*Cavitation, Gas flow), Aerodynamic configurations, Flat plate models, Flow visualization, Angle of attack, Pitch (Motion), Models (Simulations), Drag, Pressure, Lift.

The purpose of the experimental program was to provide the basic characteristics of the cavitating flow past delta wings, to observe and outline any interesting features of these flows and, finally, to provide a physical basis for any mathematical analysis of the flow that might be undertaken. Measurements of lift, drag and pitching moment and pressure distributions were made on a family of simple flat plate delta shapes of varying apex angle; several configurations outside this family were also tested. These included a diamond plan form, reverse delta, and a delta with a 90 degree bottom. All were withoug camber and were tested with no yaw angle.

Revised ed.,
by R. R. Berlot. 7 Nov 57, 9p GM-45.3-423
Unclassified report

Revision of 9 Oct. 57 edition.

Descriptors: (*Sloshing, Theory), Conical bodies, Damping, Motion, Rotation, Mathematical models, Mathematical analysis, Fuel tanks, Tanks (Containers).

In R-W Memo GM45,3-397, Revision 1, a model for the sloshing modes was proposed. The purpose of the present note is to call attention to certain features which lend credence to this model and to indicate the necessary modification in baffle damping theory.

AD-607 875 Div. 9, 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A THIRD NOTE ON CONICAL SLOSHING,
by J. W. Green and H. J. Landau. 19 Aug 57, 14p
STL/PA/M-553/3
Unclassified report

Descriptors: (*Sloshing, Conical bodies), Fluid flow, Motion, Acceleration, Partial differential equations, Mathematical analysis, Fuel tanks, Tanks (Containers).

Equations are developed for the motion of fluid in a filled conical tank subjected to accelerations.

AD-607 886 Div. 9
OTS Prices: HC $2.00/MF $0.50

Princeton Univ., N. J.
FREE MOLECULE FLOW OVER NON-CONVEX BODIES,
by Ira M. Cohen. Feb 60, 45p AER-497
Contract AF49 638 465, Proj. 9781
AFOSR TN60 190
Unclassified report

Partially supported by the Daniel and Florence Guggenheim Foundation.

Descriptors: (*Superaerodynamics, Transport properties), (*Transport properties, Superaerodynamics), Gas flow, Heat transfer, Integral equations, Hemispherical shells, Mathematical analysis, Aerodynamic configurations, Particles, Velocity, Statistical functions.

The problem considered in this report is the determination of the velocity distribution function f and the heat transfer rate at any point on a surface of arbitrary shape immersed in a free molecule flow field. A theory is developed in which the mass flux incident on the surface of a non-convex body is expressed as the solution of an integral equation. Then the fundamental transport properties at the surface are given in terms of appropriate integrals over velocity space. As an example, a hemisphere in an infinite speed ratio flow is considered. (Author)

AD-607 933 Div. 9, 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
MEASUREMENTS OF FREE MOLECULE HEAT TRANSFER IN AIR AT MACH NUMBERS FROM 10-18,
by R. L. Varwig. 13 Oct 60, 30p
STL/TR-60-0000-94324
Contract AF04 647 504
Unclassified report

Descriptors: (*Superaerodynamics, Heat transfer), (*Heat transfer, Measurement), Wire, Gas flow, Reynolds number, Satellites (Artificial), Shock tubes.

Heat transfer measurements to fine wires in the free-molecule flow regime at Mach numbers typical of the conditions in which satellites move were made. Accommodation coefficients obtained within the accuracy of these experiments agree with those obtained at much lower Mach numbers. The heat transfer measurements taken indicate no Mach number effect. At high Reynolds numbers, where free-molecule flow is no longer obtained, agreement with previous data is reasonable down to Knudsen number equal to one, corresponding to Reynolds number of 5 or less. A further decrease in the Knudsen number concomitant with an increase in the Reynolds number yields heat transfer rates that are somewhat lower, although in essential agreement, with previously acquired data. With an appropriate calibration for the degree of rarefaction of the gas, a wire probe shows promise as a fast reacting instrument for use in gas flows of quite low density. (Author)

AD-607 934 Div. 9
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
FORMULATION OF THE THEORY OF TURBULENCE IN AN INCOMPRESSIBLE FLUID,
by H. W. Wyld, Jr. 1 Jan 61, 45p
STL/TR-61-0000-GR013
PB 154 924
Unclassified report

Prepared in cooperation with Illinois Univ., Urbana. Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Incompressible flow, Turbulence), (*Turbulence, Fluids), Theory, Perturbation theory, Numerical analysis, Partial differential equations, Integral equations, Statistical functions.

The theory of turbulence in an incompressible fluid is formulated using methods similar to those of quantum field theory. A systematic perturbation theory is set up, and the terms in the perturbation series are shown to be in one to one correspondence with certain diagrams analogous to Feynman diagrams. From a study of the diagrams it is shown that the perturbation series can be rearranged and partially summed in such a way as to reduce the problem to the solution of three simultaneous integral equations for three functions, one of which is the second order velocity correlation function. The equations have the form of infinite power series integral equations, and the first few terms in the power series are derived from an analysis of the diagrams to sixth order. Truncation of the integral equations at the lowest nontrivial order yields Chandrasekhar's equation, and truncation at a higher order yields the equations discussed by Kraichnan. (Author)

AD-607 940 Div. 9, 12
OTS Prices: HC $3.00/MF $0.75

Mithras, Inc., Cambridge, Mass.
GAS DYNAMICS OF HIGH-ALTITUDE ROCKET PLUMES.
Final rept. for 1 Jul 63-30 Jun 64,
by Henry L. Alden and Roger H. Habert. Jul 64, 84p
MC-63-80-R1
Contract AF19 628 3280, Projs. 4984, ARPA42, Task 498401
AFCRL 64 677
Unclassified report

Continuation of Contract AF19 628 415.

by L. H. Cassutt, F. E. Maddocks, and W. A. Sawyer.
[1958] 12p
Contract AF18 600 1687

Unclassified report

Descriptors: (*Liquefied gases, Handling), (*Hydrogen, Liquid rocket propellants), (*Liquid rocket propellants, Hazards), Storage, Fuels, Safety, Costs, Flammability, Air, Detonations, Deflagration, Combustion, Radiation effects, Personnel.

The need to improve propulsion systems for missiles and space vehicles has focused attention on many fuels and oxidants heretofore not considered practical for such applications. A factor in the earlier rejection of these propellants had been the extreme hazards associated with their use--at least, as revealed in laboratory programs. One of these propellants is liquid hydrogen. Although it has been a laboratory curiosity for years, there was insufficient knowledge of its characteristics to provide a sound basis for many of the design problems faced in its production and use. Its low ignition-energy requirement when mixed with air, its wide limits of flammability, and its known detonation effects under confined conditions made handling and storage hazards appear great. For these reasons, the Air Research and Development Command felt it desirable, before producing liquid hydrogen in large quantity, to initiate a research program to develop realistic safety criteria. Such criteria could bring about substantial savings in the capital equipment costs of production and storage facilities and could point out safety devices which would prevent major losses. Also a reduction in the required area for a production or storage facility might be effected thus decreasing the costs of such facilities. (Author)

AD-607 848 Div. 10, 4
OTS Prices: HC $1.00/MF $0.50

Utah Univ., Salt Lake City.
STUDIES TO DETERMINE THE MECHANISM OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES.
Quarterly rept. for 1 Sep-30 Nov 58,
by Nalin R. Mukherjee, Takayuki Fueno, Henry Eyring, and Taikyue Ree. 30 Nov 58, 5p
Contract AF04 647 177

Unclassified report

Descriptors: (*Combustion, Reaction kinetics), (*Flames, Ionization), (*Electrons, Flames), Hydrogen, Oxygen, Nitrogen, Hydrocarbons, Free radicals, Monoxides, Ions, Chemical equilibrium, Thermochemistry.

Opinions differ about the thermodynamic condition of flame reactions. Some maintain, in contradiction to others, that the electron densities in flames of certain fuel air systems are in good agreement with expected equilibrium values. The present investigation results indicate nonequilibrium conditions in flame reactions and the production of more electrons in flames than can be accounted for from thermodynamic equilibrium with the flame products. A formulation derived from the principles of cumulative excitation and chemi-ionization of reactants rather than products is presented.

AD-607 978 Div. 10, 1, 4, 13
OTS Prices: HC $3.00/MF $0.75

MSA Research Corp., Callery, Pa.
EXTINGUISHMENT OF ALKALI METAL FIRES.
Rept. for Feb 62-Jul 64,
by S. J. Rodgers and W. A. Everson. Oct 64, 100p
Contract AF33 657 8310, Proj. 8119, Task 811832
APL TDR64 114

Unclassified report

Descriptors: (*Alkali metals, Fires), (*Spacecraft, Fires), Lithium, Sodium, Potassium, Rubidium, Cesium, Helium group gases, Oxygen, Liquids, Organic compounds, Salts, Aircraft fires, Fire extinguishers, Isocyanate plastics.

The effects of inert gas blanketing and oxygen partial pressure were evaluated. It was found that reduction of oxygen partial pressure was effective in inhibiting ignition and degree of combusion of lithium, sodium, NaK and potassium. Rubidium and cesium did not ignite, i.e., there was no emission of smoke or flame. Reduced oxygen partial pressure was also effective in inhibiting ignition of alkali metal jet streams. A number of different salts, organic liquids, and polyurethane foam were evaluated with respect to alkali metal fire extinguishment. Met-L-X and TEC Powder were the most effective salts which were evaluated. The ratio of TEC Powder/alkali metal was 0.4 for 100 lb sodium fires and 0.2 for 500 lb sodium fires. Polyurethane foam was found to be effective on low temperature (1000F) fires and was useful on alkali metal fires on or under insulation. Organic liquids were not particularly effective on alkali metal fires. A section is presented on a typical alkali metal system which might be used to generate electrical power in space. (Author)

11. Ground Transportation Equipment

No Entries

10. Fuels and Combustion

AD-607 415 Div. 10, 4
OTS Prices: HC $2.00/MF $0.50

Utah Univ., Salt Lake City.
STUDIES TO DETERMINE THE MECHANISM OF PRODUCTION AND REMOVAL OF ELECTRONS IN FLAMES,
by Nalin R. Mukherjee, MarLynn R. James, William S. Hummers, Henry Eyring, and Taikyue Ree. 8 Aug 61, 44p
Contract AF04 647 177
AFBMD TR61 1 Unclassified report

Descriptors: (*Flames, Ionization), (*Aliphatic compounds, Flames), Hydrocarbons, Ions, Electrons, Chemical reactions, Oxygen, Air, Ultraviolet radiation, Molecular structure, Exhaust flames, Jet flames, Radiofrequency interference.

The mechanisms for the formation of positive ions in aliphatic hydrocarbon flames are the same as that of electrons and the discussion is centered around positive ions. Probable chain reactions and mechanism for the formation of the most abundant positive ion are summarized. A steady state analysis of reactions reveals a number of important conditions that must be fulfilled for the most abundant ion formation. Approximate values for the maximum and minimum concentrations of the most abundant ion with respect to oxygen are obtained. A semi-theoretical method is used to calculate the concentration of the most abundant ion in hydrocarbon-oxygen or hydrocarbon-air flames. Experimental studies were performed on the effect of ultraviolet light on ion concentration in flames. Research has also been started on the effect of the degree of unsaturation, state of oxidation, and length of the carbon chain on ionization of various hydrocarbons in a hydrogen-oxygen flame. (Author)

AD-607 431 Div. 10
OTS Prices: HC $2.00/MF $0.50

New York Univ., N. Y. Coll. of Engineering.
PHOTOTHERMOVISCOELASTIC ANALYSIS OF A CASE BONDED ROCKET GRAIN,
by Herbert Becker and Angelo Colao. Aug 62, 50p
SM-62-10
Unclassified report

Sponsored by Lockheed Propulsion Co., Redlands, Calif.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Rocket propellant grains, Thermal stresses), Solid rocket propellants, Photoelasticity, Viscoelasticity, Thermal properties, Models (Simulations), Epoxy plastics, Isocyanate plastics.

An experimental program was performed to obtain meaningful data on transient thermal stresses in a case bonded circular port rocket grain model for correlation with theory. Both the experimental procedure and the theory were developed as part of the program. Consequently the reliability of the experimental data ultimately must await comparison of the data with the newly developed theory. The data reveal the progress of the thermal stress field from the inception upon a cold (and essentially elastic) grain through the transition to a warm (and principally viscoelastic) grain. The data were reproducible and are considered to be scientifically meaningful (Author)

AD-607 636 Div. 10
OTS Prices: HC $2.00/MF $0.50

Reaction Motors Div., Thiokol Chemical Corp.,
Denville, N. J.
SOLID PROPELLANT TRACING METHODS.
Semiannual scientific rept. for 15 Oct 63-14 Mar 64,
by David Fleischer. Apr 64, 36p RMD-5510-SA
Contract AF49 638 1197
AFOSR 64 1954
Unclassified report

Descriptors: (*Solid rocket propellants, Combustion), (*Combustion products, Tracer studies), Rocket motor nozzles, Exhaust gases, Absorption spectrum, Burning rate, Exhaust flames, Electrons, Impurities, Ionization potentials, Sodium compounds, Chlorides, Chemical equilibrium, Reaction kinetics, Thermodynamics.

The investigation of the use of light absorption signals in motor exhausts for determining motor burning rates was terminated. It is concluded that erratic absorption and diffraction from solid particles and the shock structure in the exhaust prevent this method from yielding useful results. Work concerning the effects of trace species on the electron concentration in combustion gases was initiated. The systems of interest always contain low ionization potential impurities, whose concentration is affected by the formation of compounds, stable at flame temperatures. The effect of sodium chloride formation on the concentration of trace amounts of sodium was measured. It has not yet been possible to provide a conclusive interpretation of this data based on either equilibrium or kinetic considerations. (Author)

AD-607 817 Div. 10, 4, 25, 27
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE ROLE OF ELECTRON ATTACHMENT IN A ROCKET EXHAUST,
by Jerry H. Buss. 1 Feb 61, 16p
STL/TM-61-0000-19011
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Exhaust gases, Rocket motors), (*Electrons, Exhaust gases), Theory, Thermodynamics, Chemical reactions, Combustion products, Recombination reactions, Mathematical analysis, Impurities, Rocket propellants, Plasma physics.

Numerous investigations have shown that a large number of free electrons are present in a rocket exhaust. Because these electrons interfere with telemetry they have been the subject of several studies ranging in motive from discovering their source to inhibiting their production. The puzzling feature of the problem has been the failure of thermodynamics to predict the measured concentration of free electrons in the exhaust. One theory which has been capable of explaining this anomaly in part treats the impurities in the fuel (notably sodium and potassium) rather than the fuel itself as the source of these electrons. New fuels, which have recently been tested, have been found to have a concentration of free electrons which can not be predicted by the simple impurity ionization theory outlined above. This fact has caused a re-examination of the impurity theory and this paper is an account of some calculations which show that there is a plausible explanation for the breakdown of the theory.

AD-607 834 Div. 10
OTS Prices: HC $1.00/MF $0.50

Little (Arthur D.) Inc., Cambridge, Mass.
A STUDY OF THE HAZARDS IN STORAGE AND HANDLING OF LIQUID HYDROGEN,

vironmental factors on missile parts and components for the following cases: (1) When the effects of pre-operational environments are being investigated. (2) When environmental test facilities are sufficiently sophisticated to allow simultaneous application of operational environments to be made while the item is functioning. (3) When conditions (1) and (2) are satisfied and both types of information are being studied. The investigation of the behavior pattern of the items over the environmental space is carried out by combining censored life testing with statistical experimental designs and illustrating the results by response surfaces. (Author)

AD-607 516 Div. 12, 15
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge Inc., Los Angeles, Calif.
ERRORS IN ARBITRARY COMPONENTS OF POSITION AND VELOCITY VECTORS,
by A. G. Mencher and R. A. Satten. 24 Jun 57, 11p
GM-TM-176, GM36.1-345
Contract AF18 600 1190

Unclassified report

Descriptors: (*Vector analysis, Errors), (*Trajectories, Vector analysis), Statistical analysis, Differential geometry, Functions, Equations, Velocity, Position finding.

Formulas are presented for obtaining the standard deviation in components of the position and velocity vectors relative to a coordinate system O' when a set of position and velocity components are known relative to a coordinate system O' assuming standard deviations in the components of vector r relative to O' are known. When the origins of O and O' coincide, the results can apply to rotated coordinate systems.

AD-607 541 Div. 12
OTS Prices: HC $3.00/MF $0.75

Air Force Aero Propulsion Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
EXPANDABLE STRUCTURES FOR SPACE APPLICATIONS,
by F. W. Forbes. 30 Jul 64, 66p

Unclassified report

Descriptors: (*Extendable structures, Spacecraft), (*Spacecraft, Extendable structures), Balloons, Membranes, Expanded plastics, Honeycomb cores, Geometric forms, Materials, Inflatable structures, Communication satellites (Passive), Shelters, Space stations, Reentry vehicles, Fibers, Glass textiles, Laminated plastics.

This paper summarizes the major types of expandable structures which are as follows; inflatable balloon, rigidized membrane, airmatt, foamed-in-place, expandable honeycomb and variable geometry structures. Emphasis is placed on materials, system characteristics, and advancements required to perfect each type of expandable structure. Finally, a discussion is given on future significant expandable structures experiments that will be conducted by the Air Force. (Author)

AD-607 547 Div. 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
DYNAMIC EQUATIONS FOR MISSILE STABILITY ANALYSIS,
by J. L. Hieatt and J. L. Palmer. Jul 60, 68p
STL/TM-60-0000-00063 Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Guided missiles, Stability), (*Equations, Dynamics), Deflection, Sloshing, Configuration, Control systems, Motion, Center of mass, Programming (Computers), Boundary value problem, Matrix algebra.

This report develops a method of presenting missile dynamics such that the equations may be easily adapted to any missile system configuration. Standardization of the missile dynamic equations is accomplished by combining the effects of propellant sloshing, flexible vehicle structure, and engine dynamics in a set of orthogonal coordinates. This approach is termed 'combined mode representation'. The theory of combined mode representation is presented in general terms. The complete missile system dynamic equations are then derived using this representation. The derivation of the equations for obtaining the combined mode coordinates is followed by a description of the computer routine used to solve these equations. Finally an example control system problem is written in terms of combined modes. (Author)

AD-607 552 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
GENERALIZED MISSILE DYNAMICS ANALYSIS. III. AERODYNAMICS,
by J. W. Miles and Dana Young. 7 Apr 58, 18p
STL/GM-TR-0165-00360; STL/EM-8-9
PB 163 579

Unclassified report

Descriptors: (*Guided missiles, Aeordynamic characteristics), (*Aerodynamic characteristics, Guided missiles), Trajectories, Mathematical analysis, Equations, Slender bodies, Theory, Perturbation theory.

The aerodynamic forces acting on a missile in consequence of small perturbations from a prescribed trajectory are calculated on the basis of slender body theory and piston theory is applied, in some detail, to the specific example of Generalized Missile Dynamics Analysis, II - Equations of Motion.

AD-607 553 Div. 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Santa Monica, Calif.
DYNAMIC STABILITY OF PENDULOUS MISSILE SUSPENSION SYSTEM,
by V. Chobotov. 28 Nov 60, 34p STL/TR-60-0000-19386; EM-10-18

Unclassified report

Descriptors: (*Suspension devices, Guided missiles), (*Vibration isolators, Guided missiles), (*Guided missiles, Vibration isolators), Dynamics, Stability, Differential equations, Mechanics.

The stability of a pendulum with two degrees of freedom at the support point is considered. The differential equations for this system are two coupled second order differential equations with a periodic coefficient. The stability of such equations, which describe the motion of a missile on a shock mount, can be studied by the direct method of Liapunov. The basic technique is used to derive the stability criterion coefficients as converging series. The basic technique, however, does not provide a useful solution since too many terms are required for convergence. To avoid this difficulty, it is shown that the series can be summed for the special

12. Guided Missiles

AD-607 411 Div. 12, 22
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ANALYSIS OF BALLISTIC MISSILE PERFORMANCE. PART I. BASIC THEORY,
by J. E. Brooks. 21 Apr 61, 32p
STL-7102-0027-MU000
Unclassified report

Descriptors: (*Guided missiles (Surface-to-Surface), Ballistics), (*Ballistics, Guided missiles (Surface-to-Surface)), Impact prediction, Kill probabilities, Propellant burn-out, Propellant control, Targets, Range finding, Statistical functions, Performance (Engineering), Analysis.

The analysis of ballistic missile performance involves the determination of targets for which the effect of propellant depletion is statistically acceptable. Therefore, the probability of avoiding propellant depletion prior to normal guidance shut down, plays a fundamental role. This probability is determined in terms of the statistics of system parameters by assuming a linear expansion of the propellant reserve function over a region corresponding to dispersion for a particular launch-site/target combination. Alternately, a range function can be utilized to obtain the same result. When considering the target-range at constant probability it is useful to define range-exchange coefficients. Methods are discussed for utilizing such exchange coefficients to adjust previously obtained performance results to account for changes in system parameters. Also, some additional approximations are considered. The results are not essentially new but an attempt at a more complete and rigorous presentation is attempted. (Author)

AD-607 412 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
OPTIMUM STAGE-WEIGHT DISTRIBUTION OF MULTISTAGE ROCKETS,
by John J. Coleman. 3 Feb 60, 23p
STL/TN-60-0000-09036; SDA-60-3
Unclassified report

Descriptors: (*Guided missiles, Weight), (*Weight, Guided missiles), Staging, Design, Payload, Optimization, Ranges (Distance), Rocket motors, Structures, Mathematical analysis.

In this analysis a generalized method is developed for determining the optimum stage-weight distribution for multistage rockets. Inclusion of the variations in structural factors with stage weights in the optimization process is shown to lead to a more generalized set of optimum conditions. Expression of all rocket weight parameters in terms of the stage weights allows for convenient optimization as well as for a comparison with previous optimization methods. This approach permits improved optimum design over existing methods for maximizing payload ratios for given ranges and for maximizing ranges for given payload ratios. An evaluation of previous methods is included for comparison purposes, and the limitations of these previous methods are discussed. (Author)

AD-607 422 Div. 12, 6, 8, 19
OTS Prices: HC $1.00/MF $0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
ON THE USE OF PRECISION FREQUENCY SIGNALS IN SPACE,
by William E. Frye. 1960 21p LMSC-703065
Unclassified report

Descriptors: (*Satellites (Artificial), Doppler systems), (*Doppler effect, Astronautics), (*Doppler navigation, Space flight), Orbital trajectories, Stability, Frequency, Measurement, Equations, Least squares method, Masers, Phase shift, Range finding, Position finding, Antennas, Navigational aids, Space navigation.

The advent of very stable and accurate frequency sources and the development of means for improving receiver sensitivity make attractive the use of such devices as an aid to navigation and guidance in many astronautical missions. This paper reviews the application of Doppler principles and techniques to operations of earth satellites in terrestrial space, in the areas of orbit determination and use as a navaid. A radio navigation aid for lunar and interplanetary missions which employs precision frequency sources and fixed antenna beams is described. A configuration for the navaid utilizing earth and planetary satellites is proposed. (Author)

AD-607 440 Div. 12, 9
OTS Prices: HC $5.00/MF $1.00

California Univ., Los Angeles.
CONTROL SYSTEMS THEORY APPLIED TO THE RE-ENTRY OF AEROSPACE VEHICLES-II.
Final rept. for May 63-May 64,
by F. H. Kishi. Aug 64, 181p
Contract AF33 657 11477, Proj. 8225, Task 822501
FDL TDR64 48 P1
Unclassified report

Doctoral thesis.

Descriptors: (*Aerospace craft, Adaptive control systems), (*Adaptive control systems, Aerospace craft), Theory, Control systems, Linear systems, Synthesis, Flight control systems, Flight paths, Reentry vehicles, Optimization, Dynamic programming, Calculus of variations, Inequalities, Difference equations, Mathematical models, Iterative methods.

In an effort to bridge the gap between theory and practice, the re-entry problem area is chosen to apply advanced control techniques. This problem area affords many separate areas where theory could be applied. This volume is separated into two parts: Part 1 describes digital computer controlled adaptive processes which can be employed for the flight path control problem; i.e., control of a vehicle about a predetermined trajectory (optimal or otherwise). In Part 2 optimal re-entry trajectories are determined. (Author)

AD-607 505 Div. 12
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MULTI-ENVIRONMENTAL LIFE TESTING OF PARTS AND COMPONENTS IN ROCKERS AND GUIDED MISSILES BY STATISTICAL DESIGN,
by D. Kevan Lloyd. 25 Sep 57, 18p GM-TM-196
Unclassified report

Descriptors: (*Guided missile components, Environmental tests), (*Environmental tests, Guided missile components), Life expectancy, Design, Vibration, Humidity, Temperature, Analysis of variance, Statistical analysis.

This paper suggests a method studying the effect of en-

AD-607 587 Div. 12, 19
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ERROR ANALYSIS AND PERFORMANCE OPTIMIZATION OF ROCKET VEHICLE GUIDANCE SYSTEMS.
Chapter 12,
by G. A. Harter. 7 Sep 60, 48p
STL/TN-60-0000-00170

Unclassified report

Descriptors: (*Guidance, Optimization), (*Guided missiles, Guidance), Error, Analysis, Performance (Engineering), Inertial guidance.

AD-607 595 Div. 12, 2
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE STATUS AND IMPROVEMENT OF PHYSICAL CONSTANTS NEEDED FOR PRECISION TRAJECTORIES,
by Samuel Herrick. 1 Dec 58, 12p P-1559

Unclassified report

Descriptors: (*Trajectories, Data), Satellites (Artificial), Guided missile trajectories, Astrophysics, Geodesics, Statistical data, Measurement, Reliability, Lunar probes, Reviews, Gravity, Atmosphere, Physical properties, Earth.

A review is given of various physical constants which are used to determine intercontinental trajectories. Recommendations are given for improving the precision of these constants.

AD-607 601 Div. 12, 20
OTS Prices: HC $7.30/MF $2.00

Bendix Systems Div., Bendix Corp., Ann Arbor, Mich.
FLARE ACTIVATED RADIOBIOLOGICAL OBSERVATORY SATELLITE DESIGN STUDY DRAFT.
Final rept.
by L. R. Lewis and W. E. Crosmer. Aug 64, 430p
Contract AF29 601 6001, Proj. 5877
WL TDR64 67

Unclassified report

Descriptors: (*Space environmental conditions, Monitors), (*Scientific satellites, Solar flares), (*Radiation measurement systems, Satellites (Artificial)), Radiation hazards, Radiological dosage, Dose rate, Radiobiology, Payloads, Launch vehicles, Life expectancy, Orbital trajectories, Booster motors, Instrumentation, Telemeter systems, Attitude indicators, Control systems, Power supplies, Data processing systems, Cosmic rays, Manned spacecraft.

A satellite system design study was performed to determine the characteristics required of a satellite to evaluate the solar flare and radiation belt hazard to near-earth manned space missions. The study uncovered possible problem areas and investigated their solution. Scientific instrument payloads were selected to measure radiation parameters of significant importance. Trade-off studies among the system parameters were performed and system designs were recommended. A preliminary design was undertaken in each satellite subsystem area; two satellite designs were developed. The first was a sophisticated 450-pound satellite compatible with the Delta DSV-3B launch vehicle, and the second was a simplified 150-pound version compatible with the scout (SLV-1A) vehicle. In addition, breadboard design studies were undertaken on the Power Supply and Solar Flare Detection Subsystem. (Author)

AD-607 609 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
PERTURBATION METHODS FOR FREE-FLIGHT TRAJECTORIES BEYOND THE ATMOSPHERE,
by O. K. Smith. 1958, 24p STL/GM-TM-0165-00338

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Free flight trajectories, Perturbation theory), (*Perturbation theory, Free flight trajectories), Astronautics, Calculus of variations, Differential equations, Exterior ballistics, Space flight.

The behavior of the solutions of a system of ordinary differential equations as the initial conditions are varied is examined for a vehicle in free flight beyond the atmosphere.

AD-607 613 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
AN APPROXIMATION TO ORBITAL DECAY DUE TO ATMOSPHERIC DRAG.
Revised edition,
by R. W. Bruce. 16 Jun 61, 12p
SDA-59-8, STL-TM-59-R001-00410

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Orbital trajectories, Drag), Satellites (Artificial), Atmosphere, Life expectancy, Circular orbital trajectories, Mathematical prediction, Deceleration, Energy, Mathematical analysis.

This report deals with an approximation to the lifetimes of satellites dissipating energy due to atmospheric drag.

AD-607 627 Div. 12, 2, 9
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DATA FOR ESTIMATING ROCKET PAYLOADS IN TWO-DIMENSIONAL MINIMUM ENERGY ORBITS THROUGH THE SOLAR SYSTEM,
by Robert J. Salkeld. 2 Sep 58, 52p
STL/GM-TN-0165-00173

Unclassified report

Descriptors: (*Celestial mechanics, Space flight), (*Space flight, Gravity), (*Perturbation theory, Space flight), Spacecraft, Solar systems, Planets, Interplanetary trajectories, Orbital trajectories, Velocity, Payloads, Rockets, Equations, Graphics, Astronautics.

Data are presented as guides to show some of the quantitative relationships which exist among bodies of the solar system, and to indicate the influence of these bodies on vehicles traveling within the solar system. Information is given which describes the sun, the nine planets and their satellites with respect to general orientation, motion, size, mass, and the manner in which their gravitational attractions and escape velocities decrease with increasing distance. Curves are presented for the sun, the first six planets and the moon to show what velocity is required to move from an intitial distance to a final distance from each body along a minimum energy (Hohmann) ellipse. Data are given which show the influence

case considered. The results are therefore derived which can be used with accuracy and for any combination of missile parameters.

AD-607 554 Div. 12
OTS Prices: HC $3.00/MF $0.75

TRW Space Technology Labs., Inc., El Segundo, Calif.
N-STAGE GUIDED DYNAMICS SIMULATION,
by R. Hite. 20 May 60, 57p CDRC-9830.40-017
Unclassified report

Pages 3, 4 and 11 of Appendix A are missing.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Guided missile trajectories, Simulation), Staging, Guided missile simulators, Configuration, Mathematical analysis, Attitude control systems, Aerodynamic characteristics, Thrust, Acceleration, Drag, Dynamics.

The N-Stage Guided Dynamics Program is designed as a general tool for three-dimensional trajectory simulations. The sequence of in-flight discrete events, such as stage terminations, and the parameter changes at discrete points are input for the configuration. The number of allowable discrete events in a trajectory is limited only by the amount of storage available for input; which, considering the size of the 709 and 7090 machines, presents virtually no limitation. Present options make it possible to simulate most of the common ballistic impact, orbital, and space probe configurations. Computational considerations of the program include longitudinal drag, aerodynamic normal force, thrust acceleration and weight flow. All forces are applied to a point-mass missile in a two-body gravitational system. Missile attitude control may be obtained from precomputed tables, drifts, instantaneous turns or options for computed pitch commands. The dynamics simulation will accept and apply guidance program commands for attitude control and stage termination.

AD-607 556 Div. 12, 2
OTS Prices: HC $3.00/MF $0.75

Space Technology Lab., Inc., Los Angeles, Calif.
LUNAR TRAJECTORIES OF BALLISTIC MISSILE, SATELLITES AND SPACE VEHICLES,
by A. B. Mickelwait. 195968p
STL/TR-59-0000-09898
Unclassified report

Descriptors: (*Lunar trajectories, Astronautics), (*Astronautics, Lunar trajectories), Celestial mechanics, Lunar probes, Orbital trajectories, Guided missiles (Surface-to-Surface), Satellites (Artificial), Spacecraft.

The paper is concerned with the relationships between specific trajectories and the over-all system; that is, it will include a discussion of practical trajectory problems, although the theoretical trajectory aspects will also be reviewed.

AD-607 574 Div. 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
DETAILED ERROR ANALYSIS FOR SPIN-STABILIZED MISSIONS,
by H. E. Lindberg. 22 Jul 59, 33p
STL/TN-59-0000-00282, STL/EM-9-13
Unclassified report

Descriptors: (*Stabilization systems, Errors), (*Guided missile components, Stabilization systems), (*Launch vehicles (Aerospace), Stabilization systems), Satellites (Artificial), Space probes, Spin, Rockets, Thrust, Staging, Alginment, Center of gravity, Guided missile trajectories, Launching, Third-stage motors, Fourth-stage motors.

The note is intended as a computation guide for finding the total velocity error, in both magnitude and direction, for the spin-stabilized portion of satellite and deep-space probe missions. The time sequence of events and spin-up method used are typical of the Able missions, but it is anticipated that only minor modifications will have to be made in order to make computations for other missions. (Author)

AD-607 578 Div. 12, 18, 22
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
QUALITY CONTROL AND RELIABILITY FOR TOTAL WEAPON SYSTEM,
by Eloise E. Bean and Wilbur A. Steger. Jan 62, 21p P-2521
Unclassified report

Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Weapons systems, Quality control), (*Quality control, Weapons systems), Guided missiles (Surface-to-Surface), Malfunctions, Simulation, Mathematical models, Systems engineering, Reliability, Operations research.

This paper describes a major facet of a three-year-old RAND Logistics Systems Laboratory study known as LP-II. It is intended for those involved in the quality control of the reliability and overall performance of a total weapon system, whether they are helping develop the quality control procedures for the system's bits and pieces, or testing large components of the entire weapon system. While not originally intended to be of aid in this area, the study has evoked interest recently from those who are faced with the problem of evaluating each of the Air Force ballistic missile weapon systems -- Atlas, Titan, and Minuteman.

AD-607 580 Div. 12, 9
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME QUESTIONS OF AERODYNAMIC DAMPING AND DYNAMIC STABILITY.
Preliminary repts. 1-2,
by W. Heyeby. 23 Mar 49, 15p T-16
TT 64 71611
Unclassified report

Trans. of unidentified mono. n.p., n.d.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Damping, Guided missiles), (*Guided missiles, Stability), Oscillation, Aerodynamic characteristics, Dynamics, Control systems, Mathematical analysis, Guided missile trajectories, Stabilization systems.

A discussion is presented on the damping of guided missile oscillations by the surrounding air; a similarity theorem is given for damping. Dynamic stability is briefly discussed.

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Reliability, Mathematical models), (*Satellites (Artificial), Life expectancy), (*Guided missiles, Life expectancy), Failure (Mechanics), Mathematical prediction.

It is shown that the exponential distribution has severe limitations for predicting long life. The Weibull Distribution with beta = 1/2 is shown to give more realistic results. Not only, are the estimates closer to the actual values, but the latter model is less sensitive to deviations in the actual distribution from the mathematical model. Predicting reliability of a long life system from limited test results gives rise to a special class of problems. To a large extent, these problems can be alleviated by using the Weibull (beta = 1/2) distribution coupled with a correction for limited testing. (Author)

AD-607 654 Div. 12
OTS Prices: HC $3.00/MF $0.50

Missile Div., Chrysler Corp., Detroit, Mich.
SEVERAL MODELS OF SIX DEGREE OF FREEDOM EQUATIONS OF MOTION FOR A BALLISTIC MISSILE,
by R. A. Collins and W. A. Miller. 6 Mar 62, 56p
AA-TN-10-61
Contract AF04 694 25
BSD TDR62 22

Unclassified report

Legibility of this document is in part unsatisfactory. Reprcduction has been made from best available copy.

Descriptors: (*Guided missiles (Surface-to-Surface), Exterior ballistics), Aerodynamic characteristics, Perturbation theory, Equations, Motion, Gravity, Thrust, Damping, Mathematical models.

Presented in this report are total and perturbation six degree of freedom equations of motion and their derivations. Magnus force and moment were considered negligible and not included in this derivation, however, when desired they can be incorporated in the existing models. Definitions of control force, gravity, thrust and damping terms are presented in general form so that various control schemes and particular functions of the terms can be utilized without extensive modification to the equations of motion. These equations may be programmed on a large scale digital or analog computer. (Author)

AD-607 662 Div. 12
OTS Prices: HC $3.00/MF $0.75

Bendix Corp., Southfield, Mich.
RESEARCH AND EXPERIMENTAL VERIFICATION OF SUPER COMPONENT DESIGN TECHNIQUES APPLIED TO A COLD GAS REACTION CONTROLLER,
by B. R. Teitelbaum. Jul 64, 58p RLD-2620-A
Contract AF33 657 10155, Proj. 8225, Task 822502
FDL TDR64 100

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Attitude control systems, Spacecraft), (*Spacecraft, Attitude control systems), Design, Reliability, Thrust, Failure (Mechanics), Vibration, Performance (Engineering), Costs, Tests, Gases, Production.

The study is concerned with the application of 'super' component design techniques to a representative non-electronic flight control component, and evaluation of the reliability improvement attained by means of tests performed on groups of 'standard' and 'super' units. The representative component used was a cold gas, proportional mode reaction controller for space vehicle attitude control applications. Three 'super' controllers and four 'standard' controllers were fabricated, and were tested according to a plan which simulated, as far as was practical, a mission profile. The test results tended to show the 'super' units had advantages over the 'standard' units in regard to specific failure modes. However, no statistically significant difference in life characteristics between the two groups was demonstrated. This is attributed to the combination of the small numbers of samples in the test groups, and the relatively low magnitude improvement in life characteristics actually attained. (Author)

AD-607 681 Div. 12, 22
OTS Prices: HC $3.00/MF $0.75

Institute for Defense Analyses, Washington, D. C.
THE PRELIMINARY DESIGN OF HIGH-ACCELERATION SOLID-PROPELLANT ROCKETS,
by Robert H. Fox. Jul 64, 65p IDA-P-133,
IDA/HQ-64-2976
Contract SD50

Unclassified report

Descriptors: (*Rockets, Design), Optimization, Acceleration, Solid rocket propellants, Structural properties, Mechanical properties, Density, Weight, Payload, Staging, Thrust, Stresses, Theory, Burning rate.

A simplified self-consistent method for the study of high-acceleration solid-propellant rockets was developed. 'High acceleration' means values of acceleration approaching the theoretical upper limit. This limit is determined primarily by the structural material strength and density, the payload, the stage burnout velocity, and the weight burning rate and specific impulse of the available propellant.

AD-607 691 Div. 12
OTS Prices: HC $1.00/MF $0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
ACCURACY OF ORBIT DETERMINATION.
Technical memo,
by J. V. Breakwell. Oct 60, 24p LMSC-704013
Contract AF04 647 595

Unclassified report

Descriptors: (*Satellites (Artificial), Position finding), (*Orbital trajectories, Position finding), (*Position finding, Orbital trajectories), Astronautics, Numerical methods and procedures, Statistical analysis, Least squares method, Doppler effect, Errors.

This report describes a computational program, now in existence, for estimating the accuracy with which satellite positions can be calculated at any time on the basis of observations at various stations. The error in computed position is due to two main causes, at least if station location uncertainties are ignored. These are: (A) observation errors, (B) fluctuations in the orbital decay rate due to drag. It is assumed here that uncertainties in the earth's gravitational field have negligible effect on the satellite position. The treatment of (A) follows standard statistical practice: Orbital parameters are adjusted to a least-squares fit to the observations. The covariances of the estimates of the orbit parameters are then obtainable quite easily from the variances of the observation errors, assuming that the different measurements are statistically independent with zero bias.

of various planets and the moon, on vehicles leaving or approaching these bodies along two-dimensional hyperbolic trajectories. The performance of a single stage rocket is given by showing in graphical form the ideal rocket equation.

AD-607 628 Div. 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
SOFT LUNAR LANDING.
STL bibliography,
comp. by K. B. Andrews and M. N. Sloane.
May 59, 21p STL-B-8, STL/GM-59-5111-12
Unclassified report

Rept. on a literature survey of unclassified reports.

Descriptors: (*Soft landings, Bibliographies), (*Astronautics, Bibliographies, (*Space flight, Bibliographies), Space environmental conditions, Space navigation, Extraterrestrial bases, Interplanetary trajectories, Spacecraft, Photography, Space probes, Doppler systems, Manned spacecraft, Space propulsion, Flight control systems, Magnetic fields, Radar, Terminal guidance, Instrumentation, Design, Moon.

AD-607 634 Div. 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
REACTION WHEEL ATTITUDE CONTROL FOR SPACE VEHICLES. PART II. EXPERIMENTAL. SECTION 1,
by R. W. Froelich. 30 Aug 59, 82p
STL/TN-59-0000-00320
Unclassified report

See also AD-607 343.

Descriptors: (*Attitude control systems, Spacecraft), (*Spacecraft, Attitude control system), Flywheels, Stabilization systems, Inertial guidance, Instrumentation, Servomechanisms, Models (Simulations), Flight control systems, Pneumatic systems, Electronic equipment, Wiring diagrams, Feasibility studies.

A laboratory model simulating, insofar as practical, a single axis of a space vehicle with a reaction wheel control system was constructed from off-the-shelf components. The operation of this typical system is described as follows: deviation of the platform (vehicle) from a reference attitude is sensed and the resulting error signal is used to accelerate the wheel relative to the platform. The resultant reaction torque on the platform tends to reduce the deviation or error to zero. In the presence of a constant disturbance torque the steady-state behavior of the system results in a constant acceleration of the wheel, i.e., the reaction torque on the platform is equal and opposite to the disturbance torque. The function of the auxiliary gas system is to ensure that the wheel speed is maintained below a pre-set limit. When the wheel speed reaches this pre-set value the gas system is activiated, generating sufficient impulse to reduce the wheel speed to zero. The system then returns to the reaction wheel mode of control. Several novel techniques were used to develop the circuitry to drive the motors. System efficiencies in excess of 80% were achieved thus far for both DC permanent magnet and AC servo-type motors.

AD-607 637 Div. 12, 9
OTS Prices: HC $3.00/MF $0.75

Aeronutronic, Newport Beach, Calif.
AERODYNAMIC CHARACTERISTICS OF THE HYPER-ENVIRONMENTAL TEST SYSTEM DATA RECOVERY VEHICLE FOR MACH NUMBERS 0.52 TO 0.96.
Technical operating rept.,
by R. V. Warden. 26 Feb 60, 94p Aeronutronic U-826
Contract AF04 647 449
Unclassified report

Prepared in Compliance with AFBM Exhibit 58-1, Section 3.11.4.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Recovery vehicles, Stability), Transonic flight, Aerodynamic characteristics, Environmental tests, Model tests, Nose cones, Configuration, Parachute jumping, Wind tunnels.

The report presents the results of a series of tests in Convair's high-speed wind tunnel to evaluate the stability of the HETS 609A recovery vehicle in the transonic regime. The tests were run with two nose configurations at Mach numbers 0.52, 0.61, 0.67, 0.82, and 0.96. Both configurations were sufficiently stable to permit parachute deployment down to Mach 0.6. (Author)

AD-607 650 Div. 12, 9
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON MINOR CIRCLE TURNS,
by R. D. Shaver. 7 Sep 62, 5p P-2632
Unclassified report

This paper was prepared for submission to the Journal of Aerospace Sciences.

Descriptors: (*Circular orbital trajectories, Analysis), Space craft, Orbital trajectories, Transfer trajectories, Descent trajectories, Aerodynamics, Equations, Motion.

In a recent issue of the Journal of the Aerospace Sciences W. H. T. Loh introduced a definition of a minor circle turn. In the present paper, an alternative definition was suggested which appears useful in that it removes some of the restrictions found in the work by Loh. Loh's definition of a minor circle turn requires the vehicle to fly in a plane which is oriented normal to the axis of the earth and which is elevated above the equator at that distance where the plane intersects the surface of the earth at the desired latitude. While this is satisfactory for near-earth trajectories and for gentle minor circle turns, it does not appear to be capable of handling the cases where the altitudes are large and where the latitudes of the turn approach ninety degrees. To surmount this difficulty, the author defined a minor circle trajectory as that path where the vector pointing toward the center of the earth from the vehicle always cuts the surface of the earth at a constant latitude. This is equivalent to requiring the path of the vehicle to lie on the surface of a cone whose solid angle is the supplement of twice the latitude.

AD-607 652 Div. 12
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
RELIABILITY MEASUREMENT FOR LONG LIFE SYSTEMS,
by E. L. Fritz. 28 Mar 61, 31p R61SD55
Unclassified report

(*Human engineering, Errors), (*Checkout procedures, Control systems), Automatic, Computers, Programming (Computers), Simulation, Graphics, Test methods.

The development of error control techniques for the man-computer interface of an automatic checkout system is presented. To minimize human error in man-computer communication in the automatic checkout complex precedence and connection matrix techniques for use with total and partial simulation methods were developed to detect errors in operational automatic checkout computer programs. Precedence and connection matrix techniques for use with total simulation methods were incorporated into a simulation computer program which comprised a total simulation of the computer which controls an operational automatic checkout system. The modified simulation was then used to process several computer runs of an operational automatic checkout computer program. The basic conclusions were that precedence and connection matrix techniques used with total and partial simulation methods can be useful in detecting errors in operational computer-controlled automatic checkout systems. (Author)

AD-607 772 Div. 12
OTS Prices: HC $3.00/MF $0.75

Aerospace Technology Div., Library of Congress, Washington, D. C.
MATERIALS ON VOSTOK-5, VOSTOK-6, AND POLET-1 FLIGHTS: COMPREHENSIVE REPORT.
Rept. no. 1.
16 Oct 64, 70p
ATD P64 57; TT 64 71636

Unclassified report

Rept. on surveys of Soviet-Bloc Scientific and Technical Literature.

Descriptors: (*Space flight, USSR), (*USSR, Space flight), Manned spacecraft, Astronauts, Males, Females, Training, Atmosphere entry, Life support, Launching, Control systems.

Contents: Analyst's discussion of the Soviet space program; Purpose and results of the Vostok-5 and Vostok-6 flights, and the future Soviet space program; Present and future equipment for space vehicles; Space-flight command and communications network, and general data on reentry; Training of male and female cosmonauts; Cosmodrome facilities, prelaunch procedure, and launch description; The Polet-1 unmanned maneuverable space vehicle.

AD-607 818 Div. 12, 10
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
VARIATION OF WEIGHT OF BULKHEAD-INTERTANK STRUCTURE WITH BULKHEAD HEIGHT FOR CYLINDRICAL TANKS IN SERIES,
by Henry W. Baer. 20 Jul 59, 40p
STL/TM-59-0000-00376

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Propellant tanks, Configuration), (*Cylindrical bodies, Propellant tanks), Tanks (Containers), Pressure, Loading (Mechanics), Weight, Ellipsoids, Spheres, Guided missiles, Fuel tanks.

Bulkhead and intertank structures of tanks in series were analyzed to determine the configurations which yield minimum weight as a function of internal tank pressure and axial load acting on the intertank region. The problem was divided into two parts. Case I was concerned with spherical-segment bulkheads with re-entrant 'knuckles,' Case II was concerned with semispheroidal (ellipsoid of revolution) bulkheads. Each type was worked out to give optimum-weight configurations for certain bulkhead eccentricities. The parameters of the final graphs involve the relative strength of the bulkhead compared to the tank cylinder and the relative loading intensity of the thrust compared to the pressurization. The change of over-all length of the total structure with eccentricity was discussed. Graphs were presented which show the change in length with eccentricity, on the basis of which the trade-off between weight- and length-optimization can be evaluated. Example problems were worked out. (Author)

AD-607 836 Div. 12, 9, 10
OTS Prices: HC $3.00/MF $0.75

Little (Arthur D.) Inc., Cambridge, Mass.
THE APPLICATION OF CENTRIFUGAL PUMPS TO LIQUID OXYGEN LOADING SYSTEMS FOR MISSILES.
30 Jun 59, 99p ALI-C-59879-9
Contract AF04 645 34

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Centrifugal pumps, Liquefied gases), (*Liquefied gases, Centrifugal pumps), Oxygen, Guided missiles (Surface-to-surface), Liquid rocket propellants, Fuel systems, Storage tanks, Test equipment, Tests, Instrumentation, Dynamics, Cavitation, Fluid flow, Mathematical analysis, Handling.

The purpose of the reduced-scale tests described in this report was to provide data for the evaluation of the dynamics of liquid-oxygen pumping systems during transient conditions. The results are to be applied to the preparation of full-scale-pump tests. Two centrifugal pumps, each having a rated flow of 50 gpm at 125-130 ft of head, were installed in the liquid-oxygen test facility. Both pumps were driven by electric motors and were installed without insulation in the transfer line outside of the storage tank. Tests were made so that data could be obtained on the following subjects: (1) Priming time, (2) Comparison of pump transfer with pressured transfer, (3) Flow control, (4) Parallel operation, and (5) Net positive suction head. Enough head-capacity points were measured for a check to be made of the curves derived from water tests carried out by the manufacturers. The time required for the pump to become filled with saturated liquid from the instant the transfer line was opened could be predicted by calculations. The additional time required for the liquid to become subcooled enough so that the pump would prime was in some cases substantial and could not be predicted by calculations. It is possible to achieve with a pump transfer system the same performance given by a pressurized transfer system.

AD-607 845 Div. 12, 9, 10
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
EQUILIBRIUM FLOW PARAMETERS FOR THE LOX-RP-1 SYSTEM IN LARGE ROCKET NOZZLES,
by E. L. Colichman and J. G. Logan. 15 May 58,
40p STL/GM/TR-0165-00387

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

AD-607 696 Div. 12, 9
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
RE-ENTRY VEHICLE SYNTHESIS PROGRAM,
by T. L. Petersen. 21 Apr 60, 54p
STL/TR-60-0000-09103

Unclassified report

Descriptors: (*Re-entry vehicles, Synthesis), (*Atmosphere entry, Re-entry vehicles), Aerodynamic heating, Convection, Boundary layer transition, Turbulence, Heating, Programming (Computers), Design.

This report describes the current re-entry vehicle parametric study program, based on the Allen and Eggers straight line trajectory assumptions. The heating analysis considers a nonreacting cold wall, with the inclusion of a moving boundary conduction solution and boundary layer transition. The quantities determined are ablation thicknesses, insulation thicknesses, vehicle weight and aerodynamic coefficients, for varying shape, material and trajectory parameters. The computer output consists only of final integrated values rather than step-by-step computations along the trajectory.

AD-607 708 Div. 12, 8
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
RANDOM-SINE VIBRATION EQUIVALENCE TESTS ON MISSILE ELECTRONIC EQUIPMENT.
Rept. for 1 Jul-Dec 59,
by Harry R. Spence. 31 Dec 59, 59p
STL/TR-59-0000-09946
Contract AF04 647 309

Unclassified report

Descriptors: (*Guided missiles, Electronic equipment), (*Electronic equipment, Vibration), Acceleration, Environmental tests, Resonance, Experimental data, Packaging, Reliability (Electronics), Dynamics.

Random-sine vibration equivalence data has been obtained through measurements of the structural dynamics of typical missile electronic equipment packages. Response data obtained was processed by extending the application of an existing single resonator theory for sine-random equivalence to multi-resonant systems. This extension of the theory is based on the assumption that negligible interaction occurs between significant resonances. This for the most part proved justified by the data. (Author)

AD-607 714 Div. 12
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
GUIDANCE SCHEMES FOR ROCKET VEHICLES,
by C. W. Sarture. 13 Oct 60, 62p
STL/TN-60-0000-GR18

Unclassified report

Descriptors: (*Inertial guidance, Guided missiles), (*Guided missiles, Inertial guidance), Guided missile trajectories, Guidance, Instrumentation, Flight control systems, Free-flight trajectories, Velocity, Mathematics, Equations, Geometry.

Inertial guidance for rocket vehicles is discussed. The material is concerned mainly with the proper utilization of inertially derived position and velocity data in a way which will fulfill the mission objectives.

AD-607 715 Div. 12, 2
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
EFFECT OF THE EARTH'S OBLATENESS AND THE SUN AND MOON ON THE ANOMALISTIC PERIOD OF AN EARTH SATELLITE,
by M. M. Moe and E. E. Cosnett. 20 Apr 60, 20p
STL/TR-60-0000-09099

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Orbital trajectories, Satellites (Artificial)), (*Celestial mechanics, Orbital trajectories), Earth, Geometric forms, Spheres, Perturbation theory, Moon, Sun, Astrophysics, Motion, Gravity, Equations, Mathematical analysis.

Most studies of satellite orbit perturbations derive expressions for the changes in the osculating elements, but do not determine the anomalistic period explicitly. The purpose of this report is to obtain a first order expression for the anomalistic period of a satellite orbit perturbed by the earth's oblateness and solar-lunar forces. Only the J term in the earth's gravitational potential will be considered, and the solar-lunar effects will be obtained by assuming that the satellite's angular motion is very large compared to the mean angular motions of the sun and moon. Incidental to the determination of the anomalistic period, is an evaluation of the osculating elements at an arbitrary angular position within an orbital revolution. (Author)

AD-607 717 Div. 12, 26
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
A STATISTICAL TEST FOR JUDGING MISSILE RELIABILITY FROM TEST FLIGHT DATA,
by W. A. Horning. 20 Oct 55, 9p AP-4

Unclassified report

Descriptors: (*Statistical tests, Reliability), (*Reliability, Guided missiles), (*Guided missiles, Systems engineering), Operations research, Optimization, Costs, Flight testing, Failure (Mechanics), Management engineering.

By an application of Bayes' theorem, a method was obtained for determining the optimum apportionment of effort (money) between the production of operational missiles and missile testing, including component and flight testing. The proper apportionment of money between component testing and flight testing was also described. The apriori distribution required for an application of Bayes' theorem was approximated by a committee judgement. (Author)

AD-607 735 Div. 12, 30
OTS Prices: HC $3.00/MF $1.00

IIT Research Inst., Chicago, Ill.
ERROR CONTROL METHODS FOR AN AUTOMATIC CHECKOUT SYSTEM.
Final rept. for 1 Jan-14 Dec 63,
by Theodore S. Lewis and Walter J. Huebner. Mar 64, 159p
Contract AF33 657 10271, Projs. 7184, 8119
Task 718404
AMRL TDR64 17

Unclassified report

Descriptors: (*Checkout equipment, Human engineering),

AD-607 883 Div. 12, 2, 9
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
AN INTERPLANETARY TRAJECTORY PROGRAM,
by S. D. Conte, R. T. Gregory, R. J. Mercer, and J. Titus. 8 Oct 58, 33p STL/PA/1969-01
Unclassified report

Descriptors: (*Interplanetary trajectories, Celestial mechanics), (*Celestial mechanics, Interplanetary trajectories), (*Perturbation theory, Interplanetary trajectories), Mars, Venus, Geometry, Equations, Motion, Gravity, Vector analysis, Planets, Numerical methods and procedures, Space flight.

The trajectory is computed of a vehicle from the Earth to the planet Mars or the planet Venus by deriving the equations of motion under the assumption that the motion of the vehicle is influenced only by the gravitational fields of the Earth, Moon, Sun, Venus, Mars and Jupiter. The problem consists of three phases. During the first phase the influence of the Earth-Moon system is greater than that of the Sun or of the other planets. Consequently a geocentric coordinate system is used. During the second phase the influence of the Sun is predominant. Consequently a heliocentric coordinate system is used. Finally, during the third phase, the target planet (Mars or Venus) has the greatest influence on the motion of the vehicle and so a planetocentric coordinate system is used. The geocentric coordinate system used is a right handed rectangular coordinate system with the positive x-axis in the direction of the vernal equinox and the positive z-axis in the direction of the north celestial pole, that is, the coordinate system is what astronomers call the equatorial coordinate system. Subsequent systems are chosen so that the new axes are parallel to the old and so the transformations consist merely of translations as changes in coordinates are made.

AD-607 927 Div. 12, 25
OTS Prices: HC $2.00/MF $0.50

Catholic Univ. of America, Washington D. C.
AXIAL-SHEAR VIBRATIONS OF STAR SHAPED BARS, KOHN-KATO BOUNDS.
Technical rept. no. 1,
by J. H. Baltrukonis, Michael Chi, and Patricio Laura.
Oct 62, 26p
BSD TDR62 360
Unclassified report
Subcontracted to Hercules Powder Co., Magna, Utah.,
Contract AF04 647 243.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Rocket motors (Solid propellant), Vibration), (*Rods, Vibration), Shear stresses, Geometric forms, Frequency, Differential equations, Numerical analysis, Rocket propellant grains.
Kohn-Kato bounds are determined for the natural frequencies of axial-shear vibrations for a solid circular bar. Through conformal transformation and corresponding modification of the differential equations, this method is extended to the calculation of the natural frequencies of axial shear vibrations for a solid bar having a many-lobed plane, curved boundary. A numerical example is given for an epitrochoidal bar vibrating in the fundamental axial-shear mode. Approximate solutions are developed for the natural frequencies of free vibrations of solid propellant rocket motors with star-shaped perforations.

AD-607 929 Div. 12, 2
OTS Prices: HC $4.00/MF $0.75

Lockheed Missiles and Space Co., Sunnyvale, Calif.
SATELLITE INSTRUMENTATION FOR MEASURING SPACE NUCLEAR RADIATION.
Technical rept.
Nov 59, 116p LMSC-288084
Contract AF04 647 347
Unclassified report

Descriptors: (*Satellites (Artificial), Radiation measurement systems), (*Radiation measurement systems, Satellites (Artificial)), (*Cosmic rays, Radiation measurement systems), Instrumentation, Polar orbital trajectories, Low altitude, Attitude control systems, Nuclear particles, Payload, Spectrum analyzers, Dosimeters, Batteries and components, Equations.

Certain problem areas of current scientific and military interest lend themselves particularly well to investigation from Discoverer satellite orbits. These areas have been chosen for investigation with Lockheed Missiles and Space Division instruments in the first alternate payload. Data on the species, fluxes, energies, angular distributions, and time dependences of the nuclear radiations in the polar regions of the earth, for example, are necessary for a better understanding of the origins of such radiations and their effect on satellite performance. Also, more detailed knowledge of the primary cosmic radiation can lead to a better understanding of the nature and location of the sources of this radiation, its composition, and interaction with matter. The particular properties of the Discoverer satellite that make it unique for the measurement of polar and cosmic radiation are the following: polar orbit; low altitude of orbit; attitude control feature; and recoverability of portion of the payload.

AD-607 932 Div. 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE SCIENTIFIC RESULTS OF THE PIONEER V SPACE PROBE,
by John W. Lindner. Jan 61, 28p
STL/TR-61-0000-02014
Unclassified report

Presented at the 7th Annual Meeting of the American Astronautical Society, Dallas, Tex., 16-18 Jan 61.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Solar satellites, Space probes), (*Space probes, Solar satellites), (*Radiation measurement systems, Space probes), Orbital trajectories, Instrumentation, Magnetometers, Launching, Charged particles, Ionization chambers, Geiger counters, Solar radiation, Solar flares, Protons, Satellites (Artificial), Symposia.

The pioneer V space probe was launched from Cape Canaveral on March 11, 1960, inwards towards the orbit of Venus. The scientific instrumentation included a spin coil magnetometer, two radiation experiments, and a micrometeorite detector. Data were obtained for distances up to 40 million kilometers from the earth. The most significant results of these experiments are summarized in this paper. (Author)

AD-607 965 Div. 12, 30
OTS Prices: HC $3.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A STUDY OF GYRO SPIN MOTOR MONITORING TECHNIQUES,
by Paul W. Ott. Mar 60, 54p STL/TN-59-0000-09927
Unclassified report

Descriptors: (*Rocket motor nozzles, Fluid flow), Thermodynamics, Cooling, Stability, Rocket motors (Liquid propellant), Liquid rocket propellants, Liquefied gases, Oxygen, Performance (Engineering).

The problem of ascertaining the extent of attainment of thermodynamic equilibrium during combustion in large rocket engines is discussed with reference to the LOX-RP-1 system. Calculations were made of concentration, pressure, and temperature gradients in both large booster and sustainer engines. Rapid changes were found to occur in these parameters in the first foot of the nozzle. Cooling rates, exceeding 10 to the 7th power degrees R per second indicate little possibility of achieving equilibrium conditions during the initial phases of the expansion process. Since theoretical absolute reaction rate calculations are not sufficiently accurate to clarify this situation, determination of the rate of establishment of equilibrium must await experimental verification. Such experiments are required to provide needed information: (a) regarding the extent of equilibrium in existing rocket engines, and (b) for altering contours so that reversible thermodynamic equilibrium can be more nearly favored in all sections of the nozzle. (Author)

AD-607 849 Div. 12, 15
OTS Prices: HC $2.00/MF $0.50

Northrop Space Labs., Hawthorne, Calif.
SATELLITE RENDEZVOUS TRAJECTORIES.
Technical memo.,
by David A. Pierce. Apr 62, 28p NSL-62-75
Unclassified report

Formerly released by Astro Systems and Research Labs., Norair Div., Northrop Corp., Hawthorne, Calif. as ASRL-TM-60-24, Oct 60.

Descriptors: (*Rendezvous trajectories, Satellites (Artificial)), (*Satellites (Artificial), Rendezvous trajectories), Ascent trajectories, Intercept trajectories, Orbital trajectories, Transfer trajectories, Parking orbit trajectories, Rendezvous spacecraft, Numerical analysis.

Two types of satellite rendezvous trajectories were discussed: direct ascent from burnout and transfer from a parking orbit coplanar with the target orbit. Equations for the orbital elements and velocity requirements of the trajectories were presented, and numerical solutions were obtained for selected trajectories. (Author)

AD-607 870 Div. 12, 22
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
THE DYNAMICS OF POWERED FLIGHT WITH APPLICATION TO TRAJECTORY OPTIMIZATION PROBLEMS,
by Burton D. Fried. 31 Dec 57, 48p RW(ARL)-7-74
Unclassified report

Descriptors: (*Guided missiles trajectories, Exterior ballistics), Ballistics, Trajectories, Optimization, Guided missile models, Numerical methods and procedures.

Problems of missile analysis require the use of some kind of model for a missile. The discussion will be largely concerned with the extension of a simple model to include motion in two or three dimensions, although a full description of the trajectory problem will require a brief discussion of the more complex models which better describe the actual system.

AD-607 873 Div. 12
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
PRINCIPLES AND APPLICATIONS OF THE GYROSCOPE,
by Charles T. Morrow. Sep 56, 20p GM-01.1-260
Unclassified report

Descriptors: (*Gyroscopes, Guided missiles), (*Guided missiles, Gyroscopes), Gyro stabilizers, Inertial guidance, Control systems, Instrumentation, Bearings, Torque, Gimbals, Spin, Pitch (Motion) Yaw, Equations, Guidance.

An introductory survey of the gyroscope is provided, starting with relatively simple concepts and applications to missile technology and proceeding through to a few of the more involved characteristics of the device. In ballistic and other missiles, gyroscopes may contribute to two basic functions. One is control of the missile, and the other is possible inertial guidance of the missile. For a missile, the problem of control includes provision of the means for (i) minimizing the undesirable effects of wind, gusts, and other disturbances on the missile assembly and (ii) maintaining stability of missile when overriding guidance signals are introduced. The problem of guidance, on the other hand, is to provide means for generating the overriding signals that will enable the missile ultimately to hit the selected target.

AD-607 874 Div. 12, 30
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Redondo Beach, Calif.
DIGITAL COMPUTER PROGRAM FOR GENERAL MISSILE DYNAMICS SIMULATION (N-STAGE) SUMMARY OF EQUATIONS,
by E. A. Juarez. 11 Dec 61, 72p CDRC-9830.4-22
Unclassified report

Descriptors: (*Guided missile simulators, Digital computers), (*Programming (Computers), Guided missile simulators), Simulation, Mathematical models, Dynamics, Guidance, Trajectories, Guided missiles components, Design, Performance (Engineering).

This report presents a summary of the mathematical equations contained in the N-STAGE missile simulation program. This program, written for the IBM 7090 digital computer, is designed to be a flexible, high speed computation tool, useful for guidance system analysis, trajectory design, hardware evaluation, or post-flight analysis of any current or proposed missile system. The simulation is generally complete and in most instances accuracy will be limited only by the accuracy of the input data.

AD-607 876 Div. 12, 15
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
TWO MORE TRACKING TECHNIQUES,
by D. Morrison. 2 Apr 59, 7p STL/PA-2027-01/4
Unclassified report

Descriptors: (*Trajectories, Dynamic programming), (*Dynamic programming, Trajectories), Calculus of variations, Mathematical programming, Radar tracking, Optimization.

Mathematical expressions are presented for computing trajectory parameters which are to be modified in the light of new data obtained during the course of tracking (missiles and space vehicles). Linear approximations are made and expressions are minimized and solutions to equations are presented for the following variations: adding more data, shifting parameters, shifting times, and shifting coordinate systems.

13. Installations and Construction

AD-607 448 Div. 13, 9
OTS Prices: HC $6.00/MF $1.25

David Taylor Model Basin, Washington, D. C.
TABLES FOR COMPUTING THE EQUILIBRIUM CONFIGURATION OF A FLEXIBLE CABLE IN A UNIFORM STREAM,
Research and development rept.,
by Leonard Pode. Mar 51, 228p
Proj. NS830 100
DTMB 687; PB 128 853
Unclassified report

Prepared in cooperation with the National Bureau of Standards, Washington, D. C.

Descriptors: (*Cables (Mechanical), Configuration), Tables, Differential equations, Towing cables, Anchors (Marine), Fluid flow, Friction, Drag, Numerical methods and procedures, Weight, Stresses, Functions, Mechanical properties.

The general problem of the equilibrium configuration of a flexible cable immersed in a uniform steady stream is treated analytically. It is shown that, when the configuration of the cable lies entirely in a plane, the solution of the differential equations that describe the configuration can be expressed in terms of certain functions which are called the cable functions and are expressed in terms of quadratures. The specific functions that apply to the most general types of configurations assumed by round cables, when neither the weight of the cable nor the tangential drag of the cable can be neglected, are derived and tabulated. The tabulated values of these functions greatly facilitate the determination of the shape and tension of towing or anchoring cables for a large variety of practical problems both in air and water. (Author)

AD-607 593 Div. 13, 4, 16
OTS Prices: HC $1.00/MF $0.50

Arctic Health Research Center, Anchorage, Alaska.
COLOR REMOVAL FROM SURFACE WATERS BY HYPOCHLORITE,
by D. J. Baumgartner. Aug 64, 23p
Proj. 8246, Task 8246 1
AAL TDR63 38
Unclassified report

Prepared under Cross Service Agreement CSA61-1.

Descriptors: (*Water supplies, Purification), (*Hypochlorites, Water supplies), Water, Colloids, Colors, Inhibition, Chlorine, Arctic regions.

Because of the unacceptably high color and chlorine demand in surface waters at some remote U. S. Air Force radar sites in Alaska, a method was sought to remove these objectionable characteristics. Carbon filters and chemical treatment have proved either ineffective or too expensive. Treatment with hypochlorite was shown to be effective and acceptable in the laboratory, where samples showing from 40 to 70 units of color were successfully treated by chlorine doses ranging from 10 to 40 mg/l. The rate of color removal was faster at the higher doses; however, the chlorine residuals persisted for longer periods of time. (Author)

AD-607 694 Div. 13
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
WEIGHT ESTIMATES OF RING-STIFFENED, TRUNCATED CONE SHELLS, SUBJECTED TO EXTERNAL PRESSURE AND AXIAL COMPRESSION SIMULTANEOUSLY,
by Henry W. Baer. 29 Aug 60, 25p
STL/TM-60-0000-19079, STL/EM 10-20
Unclassified report

Descriptors: (*Structural shells, Weight), (*Conical bodies, Weight), Structural parts, Rings, Pressure, Compressive properties, Loading (Mechanics), Statistical analysis, Thickness.

Approximate expressions are evolved for the required weight of truncated, conical shells, stiffened at equal intervals with rings. Three cases of loading are considered, namely, external pressure only, axial compression only and a combination of the two. In the first and third loading cases, the number of ring-stiffened bays is determined by successive computations, until the number of stiffener rings is found for which the over-all weight of the structure is a minimum. Expressions are presented which -- for a given shell geometry and given loading -- define the weight, the skin thicknesses of each bay and the stiffener-ring thicknesses, provided the following quantities are specified: Modulus of elasticity and density of shell- and stiffener-material, half-angle of truncated cone shell, base and top radii, applied external pressure and applied axial compression force. The example problem further shows that minimum-weight design entails a structure with a large number of stiffener rings with relatively small width- and thickness-dimensions. (Author)

AD-607 716 Div. 13, 25
OTS Prices: HC $2.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
THE RESPONSE OF MECHANICAL SYSTEMS TO RANDOM EXCITATION,
by William T. Thomson. 23 Nov 55, 26p AM-5-13
Unclassified report

Descriptors: (*Structures, Dynamics), Motion, Noise, Damping, Stresses, Frequency, Beams (Structural), Structural parts, Vibration, Harmonic analysis, Numerical analysis, Moments, Rods, Probability.

Mechanical systems are not always excited by a harmonic force of fixed frequency and amplitude. Often the excitation input is of random nature, and the response of the system displays no orderly trends. Instantaneous values and phase are meaningless in such cases, and the problem must be treated from a statistical approach. It is the purpose of the paper to outline such an approach as related to the dynamic response of structures. (Author)

AD-607 830 Div. 13, 22
OTS Prices: HC $3.00/MF $1.25

Army Engineer Research and Development Labs., Fort Belvoir, Va.
STRUCTURAL RESPONSE AND PERMANENT DISPLACEMENT MEASUREMENTS,
by R. H. Sievers, Jr. and A. R. Stacy. Jan 60, 226p
Proj. 26.7
WT 1708
Unclassified report

Rept. on Operation Hardtack II, Apr-Oct 58.

Descriptors: (*Underground structures, Shock resistance), (*Shock waves, Nuclear explosions), Rock (Geology), Underground explosions, Vibration, Harmonic analysis, Measurement, Design.

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Monitors, Checkout equipment), (*Gyroscopes, Monitors), Guided missiles (Surface-to-Surface), Control systems, Servomechanisms, Servomotors, Reliability, Checkout procedures.

Because of the gyroscope spin motor bearing reliability problem, it is desirable to monitor proper operation of control system gyroscopes prior to missile launch. A study was undertaken to determine the present techniques for spin motor monitoring. This report details that study, presents current methods developed by other companies and by STL, and suggests future developments in this field. (Author)

such as those prescribed in the Holmes and Narver, Inc. Preshot Damage Report for Dribble, were effective in reducing pier damage. Damage was not, however, completely prevented by the cribs. No damage to unbraced buildings resulted from peak particle velocities of 9.6 cm./sec. (3.8 inches per second) and peak accelerations of 0.75 g. Peak motions of this magnitude will probably occur as far as 1.6 miles from the Dribble Salmon Surface zero, and possibly as far as 2.4 miles from Surface Zero. (Author)

Measurements and visual observations made during the Hardtack II series of underground shots provide basis for conclusions regarding shock-resistant design of protection for cavities in rock and qualitative prediction of permanent displacements in rock due to nuclear detonations. Vibration measurements on blast-resistant construction in soil provided non-nuclear test results which apply to shock-resistant design. With varying soil cover, the compressive mode predominated in arch structures and a mass of soil apparently acted with the structure that varied in magnitude in inverse fashion with two depths of cover. Underground structural harmonic response theories were in part verified, for some structures, though the absence of an appreciable flexural mode in buried arch structures was significant. (Author)

AD-607 832 Div. 13
OTS Prices: HC $3.00/MF $0.50

General Electric Co., Schenectady, N. Y.
MECHANICAL DESIGN FOR RANDOM LOADING,
Technical Information Series,
by R. M. Mains. 18 Apr 57, 56p R57GL6
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Vibration, Mechanical engineering), (*Load distribution, Mechanical engineering), (*Structural properties, Load distribution), Design, Fatigue (Mechanics), Mathematical analysis, Structures, Shock (Mechanics), Stresses, Damage, Statistical analysis, Failure (Mechanics), Probability.

The general problem of mechanical design for statistically defined loads is discussed. Various types of criteria for damage are discussed and illustrated in two problems which are worked out in some detail. One problem involves a measured structural response and a continuous vibration spectrum of excitation, while the other problem involves the calculation of structural response to a discrete frequency vibration excitation and a random shock. Relationships for the response of calculated structural characteristics to a continuous spectrum of vibration excitation are given and their use is discussed. The appendix gives a development of the fundamental relationships involved in random vibration. (Author)

AD-607 894 Div. 13, 20
OTS Prices: HC $1.00/MF $0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
STATIC AND DYNAMIC PLATE-BEARING TESTS ON DRY SAND WITH OVERBURDEN.
Technical rept. no. 2,
by Charles R. White. 7 Sep 64, 43p
Task Y F008 08 03 402
NCEL R338; DASA 13 018
Unclassified report

Descriptors: (*Sand, Soil mechanics), (*Soil mechanics, Foundations (Structures), (*Underground structures, Nuclear explosion damage), Tests, Pressure, Nuclear explosion, Simulation, Experimental data, Loading (Mechanics), Dynamics, Engineering geology.

Six static and 53 dynamic soil-bearing tests were made under simulated overburden pressures of zero to 15 psi to determine the load-displacement characteristics of buried footings. The static bearing modulus increased as overburden pressure increased up to an overburden pressure of approximately 6 psi. The dynamic bearing modulus increased exponentially with overburden pressure to an overburden pressure of 15 psi. Up to 3 psi overburden pressure, dynamic modulus was larger than static; but the difference was less at 3 psi overburden than at zero. The relationship between static and dynamic moduli was not firmly established for overburden pressures greater than 3 psi. These tests were made on a 15-inch-diameter bearing plate in dry sand using the NCEL atomic blast simulator. (Author)

AD-607 918 Div. 13
OTS Prices: HC $4.00/MF $1.00

Bureau of Mines, Reno, Nev.
STRUCTURAL SURVEY OF PRIVATE MINING PROPERTIES.
Final rept.
Dec 63, 144p
ARPA VUF1010
Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best abailable copy.

Descriptors: (*Mining engineering, Nuclear explosion damage), (*Nuclear explosion damage, Mining engineering), Nuclear explosions, Underground explosions, Explosion effects, Underground structures, Photographs, Engineering geology, Economic geology, Nevada.

Mine structures were surveyed to document any physical changes resulting from the Shoal event. Thirteen privately owned mining properties within a 20-mile radius of ground zero had been previously selected by the United States Bureau of Mines (USBM) as susceptible to potential damage from this test. Three additional mines, outside the 20-mile radius, were also examined at the owners' requests. Minor rock falls, about one cubic foot each, were observed at two properties. These falls caused no damage, and no damage which could be attributed to the Shoal event was observed at any of the properties. A detailed report of each property is contained in the appendix.

AD-607 922 Div. 13, 2
OTS Prices: HC $2.00/MF $0.50

Holmes and Narver, Inc., Las Vegas, Nev.
TEST OF DRIBBLE-TYPE STRUCTURES.
Final rept.
Jan 64, 46p
ARPA VUF1016
Unclassified report

Rept. on Vela Uniform Proj. Shoal, Fallon, Nev., 26 Oct 63. Sponsored also by the Atomic Energy Commission, Washington, D. C.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Buildings, Nuclear explosion damage), (*Foundations (Structures), Nuclear explosion damage), (*Nuclear explosion damage, Foundations (Structures)), Underground explosions, Seismic waves, Nevada.

This task was conducted at Project Shoal to observe the response of simulated Dribble area building foundations to ground motions induced by a nuclear detonation. The following conclusions pertinent to the Dribble residence bracing problem have been drawn. Peak particle velocities of from 15 to 20 cm./sec. (6 to 8 inches per second) and peak accelerations of up to 1.3 g did not cause lateral collapse of the unbraced pier foundations observed in this project. Such motions did crack the more heavily loaded interior pier blocks. Timber bracing cribs,

and F. J. Dunkerley. Aug 64, 78p
Contract AF33 657 11330, Proj. 7381, Task 738103
ML TDR64 148

Unclassified report

Descriptors: (*Refractory metal alloys, Coatings), (*Coatings, Refractory metal alloys), Thermal radiation, Emissivity, Surface properties, Stability, Niobium alloys, Tungsten alloys, Zirconium alloys, Carbon alloys, Tantalum alloys, Vanadium alloys, Molybdenum alloys, Silicon coatings, Silicides, Chromium, Diffusion, Aluminum, Boron, Spectrography, Chemical analysis, Oxidation, Refractory coatings, Reflection, Photomicrography, Reentry vehicles, Thermal properties.

Four columbium base alloys were coated with oxidation resistance coatings by four different industrial organizations and submitted to the American Machine and Foundry Company for measurement of thermal radiation and other general physical properties at 1520F. Basic acceptance data obtained for these four coated-columbium base alloys included photomicrographs of the coatings before and after a six (6) hour stability test, physical observation of the stability of the coatings at 2500F at hourly intervals to a maximum of six (6) hours, surface roughness measurements, and such thermal optical data as total normal emittance, spectral emittance and spectral reflectance. Companion specimens of the four columbium alloys coated by the four different organizations were submitted to the Materials Applications Division of RTD for their in-house thermal radiation physical property studies. (Author)

AD-607 619 Div. 14, 8
OTS Prices: HC $7.95/MF $2.50

Melpar, Inc., Falls Church, Va.
A SURVEY OF HIGH TEMPERATURE CERAMIC MATERIALS FOR RADOMES.
Technical documentary rept. for 1 May 63-1 May 64,
by L. K. Eliason and G. C. Zellner. Sep 64, 497p
Contract AF33 657 10519, Proj. 7381, Task 738105
ML TDR64 296

Unclassified report

Descriptors: (*Ceramic materials, Radomes), (*Radomes, Ceramic materials), (*Refractory materials, Radomes), Aluminum compounds, Oxides, Glass, Silicon compounds, Beryllium compounds, Boron compounds, Nitrides, Magnesium compounds, Physical properties, Thermal properties, Electromagnetic properties, Sandwich construction, Mechanical properties, Electrical properties, Experimental data, Tables, Temperature, Structures, Mathematical analysis, Erosion, Foams, Honeycomb cores, Inorganic compounds, Aerodynamic loading, Aerodynamic heating.

A comprehensive survey was conducted of available information concerning the use of nonmetallic inorganic refractory material in the fabrication of radomes for elevated temperature use. In conducting this survey, both open literature and contract reports were studied. These were augmented with facility visits and personal communications with both missile contractors and materials suppliers. The comments of other Government agencies were actively solicited to insure all active contract efforts in this field of research would be included in this report. In addition, views concerning future efforts in the fabrication of radomes from nonmetallic inorganic refractory materials were also discussed in an effort to determine the direction of advanced planning in this area of research. The available data were analyzed to determine their validity, and that information considered to be reliable and accurate was compiled in both tabular and graphical form. Throughout this effort, it was difficult to characterize completely the majority of the materials in terms of chemical composition. (Author)

AD-607 653 Div. 14, 12, 17
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
DEVELOPMENT OF COMPOSITE STRUCTURAL MATERIALS FOR SPACE VEHICLE APPLICATIONS.
Technical information series,
by Willard H. Sutton. Jul 61, 44p R61SD103
Contract NOw60 0465d

Unclassified report

Presented at the American Rocket Society Lifting Re-entry Vehicles Structures, Materials and Design Conference 4-6 Apr 61, Palm Springs, Calif.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Aluminum, Fiber metallurgy), (*Composite materials, Fiber metallurgy), (*Fiber metallurgy, Composite materials), Reinforcing materials, Filaments, Fibers, Niobium alloys, Sapphires, Refractory materials, Aluminum compounds, Oxides, Zirconium compounds, Tensile properties, Structural parts, Spacecraft, Airframes, Mechanical properties, Bonding, Tungsten alloys, Molybdenum alloys, Zirconium alloys.

The concept of utilizing the extremely high strength of filamentary crystals (whiskers) for reinforcing metals is presented. Structural considerations of filament reinforcement and the problems of attaining the full reinforcing capabilities of whiskers are now discussed. An example is given for predicting the strengths of a composite consisting of a columbium alloy (F-48) reinforced with sapphire (Al_2O_3) whiskers. Such whiskers retain a considerable portion of their strength at elevated temperatures, e.g., tensile strengths of 150,000 psi at 3570 F. Calculations showed that reinforcing F-48 alloy with 50% Al_2O_3 whiskers could improve the strength-to-density ratio more than four-fold over a 3000 F temperature range. The preliminary results of an experimental program concerned with the development of composites of aluminum reinforced with Al_2O_3 whiskers and ZrO_2 fibers are discussed. It is concluded that the crux of utilizing the full reinforcing potential of whiskers lies in the careful orientation, wetting, and bonding of the whiskers in the metal phase. (Author)

AD-607 669 Div. 14, 4, 10, 27
OTS Prices: HC $3.00/MF $0.75

Douglas Aircraft Co., Inc., Long Beach, Calif.
SOLUBILITY OF HEAVY LUBRICANTS IN CHLORINATED SOLVENTS,
by C. H. Reynales. 23 Apr 58, 58p D87-311

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Lubricants, Solubility), (*Organic solvents, Solvent action), Fuel systems, Cleaning, Optimization, Chlorination, Greases, Surface areas, Temperature, Fluid flow, Turbulence, Oxygen, Liquefied gases, Halogenated hydrocarbons, Guided missile components.

An investigation was made of the solvent action of chlorinated solvents in thick lubricants, as a means of determining optimum conditions for cleaning the liquid oxygen transfer line in the fueling system of WS315A. The results indicate that the solubility of lubricants in chlorinated solvents is directly proportional to temperature, surface area, and rate of flow. Trichloroethylene appears to be the most desirable solvent, and turbulent flow the most effective process. The action of solvents on greases appears to be specific for each type of grease and can be seriously affected by the presence of insoluble filler

14. Materials (Non-Metallic)

AD-607 418 Div. 14, 4, 25
OTS Prices: HC $6.00/MF $1.50

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
POLYMER STRUCTURES AND PROPERTIES.
Rept. for 1 Jan-31 Dec 63,
by T. A. Orofino, G. C. Berry, A. Ciferri, E. F. Casassa, and J. W. Mickey, Jr. Sep 64, 269p
Contract AF33 657 10661, Proj. 7342, Task 734203
ML TDR64 286 P4

Unclassified report

Descriptors: (*Polymers, Solutions), Styrene plastics, Molecular structure, Hydrodynamics, Thermodynamics, Viscosity, Friction, Complex compounds, Metalorganic compounds, Inorganic compounds, Polymerization, Acrylic resins, Polyvinyl alcohol, Nuclear magnetic resonance, Viscometers, Refractometers.

Theoretical and experimental investigations were made concerning properties of synthetic polymers in dilute solutions. The dependence of the molecular dimensions of linear polystyrene upon the nature of the solvent and temperature was studied under 'theta' conditions--when the configuration is 'unperturbed' by interactions of indirectly connected elements of the chain. The molecular dimensions of branched polymers in dilute solution and the second virial coefficient are the subjects of theoretical treatments: some pertinent experimental data are also presented. Preliminary dilute solution measurements are reported on two unusual coordination polymers derived from zinc methyl phenyl phosphinate and hydroxyaquo chromium diphenyl phosphinate. A 'two state' mechanism is described to explain the stereoblock structures that occasionally result from homogeneous anionic polymerizations. Experimental work in progress has two aims: to furnish more definitive evidence for the two-state mechanism and to provide synthetic methods for poly(methyl methacrylate) of narrow molecular weight distribution and controlled stereoregular structure.

AD-607 454 Div. 14, 4
OTS Prices: HC $0.50/MF $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
IDENTIFICATION AND DETERMINATION OF ETHER-ALCOHOLS IN CARBON REMOVING COMPOUNDS BY GAS CHROMATOGRAPHY,
by George Esposito. 8 Sep 64, 34p
Proj. 1HO 24401A110 05
CCL 166

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Cleaning compounds, Chromatographic analysis), (*Ethers, Chromatographic analysis), (*Alcohols, Chromatographic analysis), Carbon, Organic solvents, Vapor pressure, Thermal conductivity, Ion exchange, Polyester plastics, Glycols, Waxes.

A combination of programmed temperature gas chromatography (PTGC) and ion exchange chromatography are used for the identification and determination of 17 ether-alcohol type solvents used in low toxicity carbon removing compounds. A cationic ion exchange column is employed to remove materials that interfere with the gas chromatographic step. An internal standard is added and the solvents are separated on polyester and Carbowax columns. (Author)

AD-607 456 Div. 14, 4
OTS Prices: HC $0.50/MF $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
AN INFRARED ABSORBANCE RATIO METHOD FOR THE DETERMINATION OF PHTHALIC ANHYDRIDE IN ALKYDNITROCELLULOSE LACQUERS.
by M. L. Adams. 8 Sep 64, 28p
Proj. 1H0 24401A110 05
CCL 165

Unclassified report

Descriptors: (*Varnishes, Spectra (Infrared)), (*Plastic coatings, Spectra (Infrared)), (*Polyester plastics, Plastic coatings), Phthalic acids, Anhydrides, Nitrocellulose, Plasticizers, Absorption spectrum.

A rapid quantitative method for the determination of the phthalic anhydride content in phthalic alkyd-nitrocellulose lacquers is described which uses an infrared absorbance ratio technique applied to solvent free films of isolated vehicles. The method is dependent upon the previously determined nitrocellulose concentration. The potential extension of this principle to the determination of the phthalic anhydride content in enamels is discussed and illustrated. (Author)

AD-607 489 Div. 14, 4
OTS Prices: HC $2.00/MF $0.50

Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENT OF NONFLAMMABLE HYDRAULIC FLUIDS AND LUBRICANTS.
Bimonthly progress rept. no. 6, 18 Aug-17 Oct 64,
by E. H. Kober, H. F. Lederle, and G. F. Ottmann.
29 Oct 64, 34p
Contract NObs90092

Unclassified report

See also AD-604 490.

Descriptors: (*Hydraulic fluids, Preparation), (*Lubricants, Preparation), Phosphonitrile chlorides, Fluorine compounds, Chlorine compounds, Organic nitrogen compounds, Organic phosphorus compounds, Synthesis (Chemistry), Flammability, Solubility, Viscosity, Antioxidants.

The addition of ethylene oxide or glycidol to tetrameric bis (p-hydroxyphenoxy) phosphonitrile resulted in the formation of water-soluble fluid products. The synthetic method for tetrameric bis (p-nitrophenoxy) phosphonitrile - an intermediate for water-soluble products -, an improved procedure fot the chloromethylation of trimeric bis (phenoxy)-phosphonitrile, and a method for converting the chloromethylated product to the corresponding hydroxy-methyl compound were developed. Trimeric N-methyl-m-chloroanilino-2, 2, 2-trifluoroethoxy-phosphonitrile was prepared. This compound had a spontaneous ignition temperature slightly higher than trimeric N-methyl anilino-2, 2, 2-trifluoroethoxy-phosphonitrile. Utilization of a trimer-tetramer phosphonitrilic chloride mixture in place of the pure compounds for the synthesis of substituted aryloxy-2, 2, 2-trifluoroethoxy phosphonitriles was investigated and found to be feasible. (Author)

AD-607 530 Div. 14, 17
OTS Prices: HC $3.00/MF $0.75

American Machine and Foundry Co., Alexandria, Va.
COATED REFRACTORY METAL EMITTANCE SPECIMENS.
Rept. for 1 May 63-29 Feb 64,
by H. W. Leavenworth, Jr., E. A. Schatz, M. E. Browning,

Descriptors: (*Vaporization, Materials), (*Refractory materials, Vaporization), (*Mass spectroscopy, Ceramic materials), (*Ceramic materials, Vaporization), Stability, Gases, Molybdates, Tungstates, Molybdenum compounds, Tungsten compounds, Magnesium compounds, Calcium compounds, Strontium compounds, Tin compounds, Dissociation, Oxides, Thermochemistry, High-temperature research, Phase studies.

A number of ternary oxides have been identified in the gas phase by mass spectrometry, while vaporizing MgO, CaO, SrO and SnO2 + Sn from Mo and W crucibles. The approximate stabilities of the gaseous molecules MgMoO4, CaMoO4, SrMoO4, MgWO4, CaWO4, SrWO4, SrMoO3, CaWO3, CaMoO3, SnWO4 and Sn2WO5 were deduced from the measurements. The dissociation energies (kcal/mole) into gaseous oxides are presented.

AD-607 798 Div. 14
OTS Prices: HC $4.00/MF $0.75

Electronic Properties Information Center, Culver City, Calif.
A SURVEY MATERIALS REPORT ON TETRAFLUOROETHYLENE (TFE) PLASTICS.
Special rept.,
by John T. Milek. Sep 64, 107p EPIC-S-3
Contract AF33 615 1235, Proj. 7381, Task 738103
Unclassified report

Descriptors: (*Halocarbon plastics, Physical properties), (*Polyethlene plastics, Physical properties), (*Fluoring compounds, Alkenes), Halogenated hydrocarbons, Mechanical properties, Electrical properties, Thermal properties, Chemical properties, Radiation damage, Joining, Cryogenics, Matherial forming, Bibliographies, Tables.

A survey of the following properties of tetrafluoroethylene plastics was made: mechanical, Electrical, thermal, chemical and irradiation behaviour. Each property set of data represents the greatest range of parameters: temperature, frequency, pressure, voltage and environmental conditions (vacuum, radiation, etc.) found in the literature. The effects of fillers on every property are also detailed where such data were available. Applications such as space, mechanical, electrical and cryogenic, are treated in some detail for the various fabricated forms of tetrafluoroethylene. A brief discussion of forming and fabrication, joining and fastening methods, and sources of specifications is given to aid the designer in selecting tetrafluoroethylene plastics for various applications. (Author)

AD-607 828 Div. 14
OTS Prices: HC $6.00/MF $1.50

Massachusetts Inst. of Tech., Cambridge.
INVESTIGATION OF MECHANICS OF REINFORCED PLASTICS, PART II.
Technical documentary rept. for 1 Oct 59-30 Nov 60,
by Lawrence J. Broutman, William H. Haslett, Edward M. Krokosky, John R. Roy, and Frederick J. McGarry. Mar 62, 261p
Contract AF33 616 6280, Projs. 7340, 0 8 7021, Tasks 734003, 73656
WADD TR60 746 Pt 2; N63 15465
Unclassified report

Descriptors: (*Glass textiles, Composite materials), (*Laminated plastics, Reinforcing material), (*Reinforcing material, Laminated plastics), Stresses, Glass textiles, Thermosetting plastics, Joints, Failure (Mechanics), Polyester plastics, Loading (Mechanics), Strain (Mechanics), Structures, Mathematical analysis, Deformation, Processing, Bonding, Mechanical properties.

Four aspects of the mechanics of reinforcement have been studied: 1) shrinkage stresses in thermosetting resin-fibrous glass systems containing relatively few glass elements; 2) improvement of a method for directly testing the strength of the resin-glass fiber joints; 3) a detailed investigation of flexural failure mechanisms in fabric-based laminate, and; 4) particular solutions for aeolotropic plate behavior derived from the more general theory previously developed. In the same order, the significant findings include: 1) high axial stresses can be created in fibers, depending upon their length, diameter, surface condition and relative orientation; 2) polyester-glass fiber joint strengths reach a maximum value, contingent upon cure exotherm, while stronger epoxy-glass fiber specimens usually fail before interfacial fractures occur; 3) some of the modes of flexural fracture and the test method-material-strength interactions which apparently occur remain obscure though good progress was made, and; 4) interlaminar stress and strain effects in plate specimens, thought to be operative from common qualitative experimental observations are substantiated by theoretical analysis. (Author)

AD-607 829 Div. 14
OTS Prices: HC $1.00/MF $0.50

General Electric Co., Schenectady, N. Y.
THE DEPOSITION OF PYROLYTIC GRAPHITE,
by R. J. Diefendorf. May 60, 17p R-60-RL-2432M
Unclassified report

Descriptors: (*Pyrolytic graphite, Coatings), Crystal growth, Gases, Temperature, Pressure, Diffusion, Physical properties, Low-temperature research, Composite materials, Vapor plating, Graphite.

The study of the deposition processes in pyrolytic graphite, made from the gas phase, has been largely empirical. The work presented attempts to show that the deposition is controlled by reactions in the gas phase. Experiments were performed at fast and slow rates of growth using natural, pyrolytic, and commercial graphites as substrates. The deposition processes occurring at various temperatures and pressures for all three substrates are described. (Author)

AD-607 838 Div. 14, 25
OTS Prices: HC $2.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
MATERIAL AND STRUCTURES. MOLECULAR STRUCTURE AND THERMODYNAMICS PROGRAM. PART I, MOLECULAR STRUCTURE.
Semiannual technical rept. for 1 Jul-31 Dec 61,
by S. Siegel and K. B. Eisenthal. 28 Feb 62, 31p
TDR-930(2240-51)TR-1, pt. 1
Contract AF04 647 930
DCAS TDR62 57 P1
Unclassified report

Descriptors: (*Materials, Molecular structure), (*Molecular structure, Materials), Thermodynamics, Spectrum analyzers, Instrumentation, Ice, Gamma rays, Cryogenics, Ionization, Radiation damage, Decay schemes, Nuclear energy levels, Hydroxides, Stability, Paramagnetic resonance.

The laboratory in which the experimental aspects of the Molecular Structures program will be carried out has been designed and constructed. The majority of the main instrumentation to be employed has been assembled and

materials used in grease manufacture such as the metallic stearates. A solvent cleaning system with a flow velocity of 1.12 ft/sec (100 G.P.M.), at a temperature of 180F ± 5, used for a period of 10 minutes in a single flushing process through the 6 inch transfer line should be sufficient to clean out any contaminant found in normal operations. (Author)

AD-607 684 Div. 14, 4
OTS Prices: HC $4.00/MF $0.75

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
TECHNICAL REPORT NO. 12, MARCH 1, 1964-AUGUST 31, 1964. CRYSTALLIZATION, MECHANICAL PROPERTIES, AND PREPARATION OF POLYMERIC MATERIALS
31 Aug 64, 121p
Contract Nonr2693 00, Proj. NR356 407
Unclassified report

See also AD-600 249.

Descriptors: (*Siloxanes, Crystallization), (*Nylon, Crystallization), (*Polyethylene plastics, Crystallization), (*Inorganic polymers, Mechanical properties), (*Styrene plastics, Synthesis (Chemistry)), Polyamide plastics, Crystal structure, Transition temperature, Molecular structure, Nucleation, Molecular weight, Creep, Viscoelasticity, Zinc compounds, Organic phosphorus compounds.

Contents: Crystallization of poly-tetramethyl p-silphenylene siloxane polymers; Spherulite crystallization: Part I-'Odd-even' polyamides: nylon 5.6 and nylon 9.6; crystallization of Polyamides: Part II-Nylon 6 and nylon 66; crystallization and morphology of d,l- and l-polypropylene oxide polymers; Glass temperature and crystal modification of linear polyethylene; Creep and recovery properties of a zinc Phosphinate polymer; Investigation on novel inorganic polymers; Viscoelasticity of crystalline polymers; The preparation and characterization of some star- and comb-type branched polystyrenes; Preparation of model polystyrenes.

AD-607 742 Div. 14, 25
OTS Prices: HC $5.00/MF $1.00

Lexington Labs., Inc., Cambridge, Mass.
THERMAL RADIATION CHARACTERISTICS OF TRANSPARENT SEMI-TRANSPARENT AND TRANSLUCENT MATERIALS UNDER NON-ISOTHERMAL CONDITIONS,
by Robert C. Folweiler and William J. Mallio.
Jun 64, 151p
Contract AF33 657 11280, Proj. 7360, Task 736001
ASD TDR62 719 P2
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-600 370.

Descriptors: (*Refractory materials, Thermal radiation), Ceramic materials, Aluminum compounds, Magnesium compounds, Silicon compounds, Oxides, Strontium compounds, Titanates, Thermal properties, Reflection, Absorption, Scattering, Emissivity, Blackbody radiation, Heat transfer, Test equipment.

Thermal radiation from refractory oxides is a volume, rather than a surface phenomenon in the wavelength range 0.5-6 microns. Emissivity values were calculated for specially prepared Al2O3, MgO, SiO2 and SrTiO3 samples from appropriate reflectivities, absorption coefficients and scattering coefficients derived from material characteristics (index of refraction, single crystal transmissivity, pore size and concentration). Experimental measurements of emissivity for these samples were made at temperatures up to 1200C and at wavelengths from one to fifteen microns. The Hamaker equations for non-isothermal emissivity, which linearize the temperature gradient, were compared with the exact solution by numerical integration. Evaluation of the rotating blackbody slot system indicates it gives results in good agreement with an external blackbody. (Author)

AD-607 763 Div. 14, 10, 27
OTS Prices: HC $4.00/MF $0.75

Union Carbide Corp., Lawrenceburg, Tenn.
RESEARCH AND DEVELOPMENT ON ADVANCED GRAPHITE MATERIALS. VOLUME XXXVI. STUDIES OF THE QUALITY OF PETROLEUM COKE FROM A PILOT SCALE DELAYED COKER.
Rept. for Jul 62-Apr 63,
by C. F. Stout, M. Janes, and J. A. Biehl. Aug 64, 124p
Contract AF33 616 6915, Projs. 7350, 7381, Tasks 735002, 738102
WADD TR61 72 V36
Unclassified report

See also AD-601 407.

Descriptors: (*Petroleum, Processing), (*Graphite, Manufacturing methods), (*Bonding, Graphite), Mechanical properties, Binders, Processing, Temperature, Pressure, Furnaces, Tar, Thermal expansion, Elasticity, Resistance (Electrical), Extrusion, Sulfur, Density, Refractory materials, Rocket motor nozzles.

This report describes the design, construction, and operation of an experimental delayed coking unit for the conversion of petroleum residues to coke for use as the filler component in graphite for aerospace applications. The effect of changes in operating conditions of the experimental coker, e.g., time-temperature, pressure, and recycle ratio was investigated with respect to the physical properties of graphitized extruded and molded samples. Four basic charge stocks were studied: vacuum residuum, slurry (decant) oil, thermal tar, and a low sulfur thermal tar. Variations in raw coke bulk density are reported; in addition, data concerning kerosene density, ash, and sulfur content of the 1000C calcined cokes are also included. Changes in bulk density, weight, and volume of the extruded and molded test samples resulting from the processing steps of baking and graphitizing are reported. The CTE (coefficient of thermal expansion), specific resistance, and flexural strength of the graphitized molded plugs in both the with- and across-grain directions are reported as well as the same properties for the with-grain direction of extruded rods. (Author)

AD-607 780 Div. 14, 4, 25
OTS Prices: HC $1.00/MF $0.50

Brussels Free Univ. (Belgium).
VAPORIZATION OF COMPOUNDS AND ALLOYS AT HIGH TEMPERATURES. PART XXIV. MASS SPECTROMETRIC DETERMINATION OF THE STABILITY OF GASEOUS MOLYBDATES, TUNGSTATES, MOLYBDITES AND TUNGSTITES OF MAGNESIUM, CALCIUM, STRONTIUM AND TIN,
by G. Verhaegen, R. Colin, and J. Drowart. Sep 64, 18p
Contract AF61 052 225, Proj. 7350, Task 735001
WADD TR60 782 P24
Unclassified report

See also AD-607 511.

Descriptors: (*Hydraulic fluids, Synthesis (Chemistry)), Phosphine oxides, Amines, Phenols, Ethers, Flammability, Ignition, Solubility, Viscosity.

Alkoxylation of amino diphenyl oxides, hydroxy diphenyl oxides, methylene diphenols, methylene dianilines and biphenol with ethylene oxide and/or glycidol resulted in water-soluble fluids. Many of these fluids met the target specifications for flash point, fire point, pour point, autogenous ignition temperature, but their aqueous solutions, adjusted to a viscosity of 28 ± 3 cs at 150F, have viscosities which are in excess of 850 cs at 25F. Alkoxylation products of tris (hydroxymethyl) phosphine oxide and of substituted hydroxymethyl phosphine oxides possessed unexpectedly low autogenous ignition temperatures in the range of 750-825F. (Author)

AD-607 949 Div. 14, 4, 8, 25
OTS Prices: HC $3.00/MF $0.75

Electronic Properties Information Center, Culver City, Calif.
SULFUR HEXAFLUORIDE.
Data sheets,
by John T. Milek. Oct 64, 73p DS-140
Contract AF33 615 1235, Proj. 7381, Task 738103
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Sulfur compounds, Fluorides), (*Fluorides, Sulfur compounds), Electrical properties, Dielectrics, Data, Graphics, Dielectric properties, Electronics.

A compilation of the electrical properties of sulfur hexafluoride, a dielectric gas, is presented. Electrical properties include corona, dielectric constant, dissipation factor and dielectric strength. The latter property data section is segregated into parameter effects as follows: pressure, gap distance, temperature, electrode configurations and gas mixtures. Each property is compiled over widest possible range of parameters obtained in a thorougt search of the world's literature. (Author)

AD-607 977 Div. 14, 12
OTS Prices: HC $4.00/MF $1.00

IIT Research Inst., Chicago, Ill.
UTILIZATION OF REFRACTORY NONMETALLIC MATERIALS IN FUTURE AEROSPACE VEHICLES. PART I. REVIEW OF STRUCTURAL DESIGN TECHNIQUES FOR BRITTLE COMPONENTS UNDER STATIC LOADS.
Rept. for Feb-May 63,
by Ralph L. Barnett. Sep 64, 134p
Contract AF33 657 8339, Proj. 1368, Task 136809
FDL TDR64 123 P1 Unclassified report

Descriptors: (*Refractory materials, Structures), (*Structures, Brittleness), (*Brittleness, Refractory materials), Fracture (Mechanics), Mathematical analysis, Design, Loading (Mechanics), Statics, Statistical analysis, Mathematical models, Statistical functions, Stresses, Ceramic materials, Aluminum compounds, Oxides, Steel, Beryllium compounds, Cotton, Fibers, Deformation, Tensile properties, Aerospace craft.

A systematic review of structural design techniques for brittle materials is presented with particular emphasis on statistical fracture theories. The properties of both series and parallel statistical models are discussed, and a critical analysis is given for the experimental data which is available in the literature. The relationship of extreme value statistics to the fracture problem is thoroughly exploited. A survey of brittle test specimens and design rules-of-thumb is included, together with a number of very promising design philosophies. (Author)

AD-607 984 Div. 14, 17
OTS Prices: HC $2.00/MF $0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
INVESTIGATION OF BONDING IN OXIDE-FIBER (WHISKER) REINFORCED METALS.
Quarterly rept. no. 7, 1 Jan-31 Mar 64,
by Willard H. Sutton. Mar 64, 27p
Contract DA36 034ORD3768Z, Proj. 1HO 24401A11
AMRA CR63 01 7
Unclassified report

Descriptors: (*Composite materials, Bonding), (*Ceramic fibers, Reinforcing materials), (*Reinforcing materials, Ceramic fibers), Nickel, Additives, Surface-active substances, Sapphires, Aluminum compounds, Oxides, Nickel alloys, Aluminum alloys, Copper alloys, Indium alloys, Titanium alloys, Zirconium alloys, Chromium alloys, Surface tension, Shear stresses, Drops, Vacuum, High-temperature research, Adhesion, Alloys, Single crystals.

The effects of various additives to nickel on its wetting and adherence to sapphire (alpha-Al2O3) were investigated by preparing special binary alloys containing one atomic percent of Al, Cu, In, Ti, Zr, and Cr. Sessile drop experiments were conducted in vacuo (5 x 1000000 Torr) at 148C to 1500C in order to observe the contact angles and the degree of wetting. Shear tests were conducted on the solidified sessile drops of nickel. Values as high as 25,000 psi were recorded for the nickel drop containing chromium. (Author)

installed. Some of this equipment is described in detail. Two aspects of the program to study the interaction of radiation with matter are described in some detail. The first study involves the interaction of ice with high energy gamma-rays, and a theoretical model is described which predicts the buildup curve of stabilized hydroxyl radicals at 77K. The second part of the program involves the role of the triplet state in intermolecular energy transfer. Some preliminary results are reported which illustrate the technique of using EPR (Electron Paramagnetic Resonance) techniques to observe triplet states at low temperatures. (Author)

AD-607 884 Div. 14, 12
OTS Prices: HC $1.00/MF $0.50

Aerospace Corp., Los Angeles, Calif.
MATERIALS AND STRUCTURES. MOLECULAR STRUCTURE AND THERMODYNAMICS PROGRAM, PART II, HIGH TEMPERATURE EQUILIBRIUM AND LUNAR RESOURCES.
Semiannual technical rept. for 1 Jul-31 Dec 61,
by S. A. Greene and J. E. Colwell. 28 Feb 62, 18p
TDR-930(2240-51)TR-1, pt. 2
Contract AF04 647 930
DCAS tdr62 57 P2

Unclassified report

See also AD-607 838.

Descriptors: (*Materials, Thermodynamics), (*Lunar environment, Materials), Vaporization, Sublimation, Synthesis (Chemistry), Halocarbon plastics, Oxygen, Pyrolysis, Reaction kinetics, Chromatographic analysis, Halogenated hydrocarbons, Flames, Water, Electrolysis, Fluorine.

Work is essentially complete on a generalized technique for the analytical solution of complex multi-element chemical equilibrium under all conditions of pressure, temperature, and mass balance. The program written for the IBM 7090 uses a unique technique of 'majors and minors' to automatically guarantee convergence. Preliminary laboratory work on the study of the O2/C2F4 flame is under way. The study relates to the ablative properties of Teflon, C2F4 being the major product of high temperature degradation. Laboratory equipment and furniture have been procured for the activation of the Lunar Resources Laboratory. The objectives of the program are to determine the feasibility of obtaining from the lunar crust oxygen for breathing and propellant usage, water for drinking or cosmetic uses, and materials for construction. Possible routes to oxygen from lunar rock (silicates) include direct thermal conversion, reaction with hydrogen at elevated temperatures followed by electrolysis of water, electrolysis of molten silicates, and displacement of oxygen with fluorine. (Author)

AD-607 890 Div. 14, 1, 26
OTS Prices: HC $1.00/MF $0.50

Prodesco, Inc., Perkasie, Pa.
DEVELOPMENT OF NOMEX MESH MATERIALS.
Rept. for Jun 63-Jun 64,
by H. brockman. Sep 64, 22p
Contract AF33 657 12257, Proj. 5708
ML TDR64 208

Unclassified report

Descriptors: (*Parachute fabrics, Nylon), (*Nylon, Parachute fabrics), Processing, Weaving, Tensile properties, Porosity, Permeability.

The objective of this contract was to develop a woven mesh material, using Nomex as the raw material yarn, having a 100 pounds per inch breaking strength in both directions and a geometric porosity of 35% or a permeability of 900-1000 cubic feet/minute/square foot. Twist levels from 5 to 20 turns per inch were evaluated in both warp and filling directions to determine the effect of twist on the permeability. Various constructions and weaves ranging from plain weave to mock leno were used to determine the maximum permeability with the required breaking strength. The mock leno weave was determined to be the most satisfactory to achieve a proper balance of properties. The level of twist affected the air permeability far more dramatically than was expected with the result that a rather high twist was used in the final product. This study demonstrated the feasibility of designing and weaving a fabric from Nomex nylon which would have the properties for use in special type of parachute applications. (Author)

AD-607 891 Div. 14, 25
OTS Prices: HC $3.00/MF $0.75

Aerojet-General Corp., Azusa, Calif.
NON-EVACUATED CRYOGENIC THERMAL INSULATION STUDIES.
Summary technical rept. for 15 Jul 63-30 Jun 64,
by C. L. Johnson and D. J. Hollweger. Sep 64, 94p
AGC-2887
Contract AF33 657 11200, Proj. 7360, Task 736001
ML TDR64 260

Unclassified report

Descriptors: (*Thermal insulation, Cryogenics), (*Cryogenics, Thermal insulation), Heat transfer, Thermal conductivity, Powders, Carbon black, Silicon, Dioxides, Models (Simulations), Transport properties, Gases, Mathematical analysis, Porous materials.

The thermal accommodation coefficient was studied for its application to very fine powders, and its probable effect on heat transfer through powders was evaluated. On the basis of the literature survey, a heat-transfer model was devised which depicts heat as being transported by three heat-transfer modes operating independently and in parallel. Experimental data was gathered on the thermal conductivity of a mixture of carbon black and silica powder. Data were collected for several powder mean temperatures and densities, with helium, neon, and nitrogen used as interstitial gases at atmospheric pressure. The heat-transfer model was compared to the experimental data, with good correlation. Analysis of the experimental data showed that the thermal conductivity of a powder is primarily dependent upon the effective gas thermal conductivity, which may be regulated to some extent by the size of the interstitial pore. It was also shown that heat transfer through interparticle contact may be very large if the interstitial gas is adsorbed upon the powder particles. Both the theoretical model and the experimental data indicate that the accommodation coefficient influences heat transport through a powder bed in only a minor way. (Author)

AD-607 948 Div. 14, 4
OTS Prices: HC $1.00/MF $0.50

Olin Mathieson Chemical Corp., New Haven, Conn.
DEVELOPMENT OF A FIRE-RESISTANT WATER-BASE HYDRAULIC FLUID.
Bimonthly progress rept. no. 3, 1 Sep-31 Oct 64,
by E. H. Kober and G. F. Ottmann. 31 Oct 64, 20p
Contract NObs90268

Unclassified report

See also AD-605 299.

AD-607 808 Div. 15
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
REMARKS ON THE EXTREME EIGENVALUES OF TOEPLITZ FORMS ASSOCIATED WITH ORTHOGONAL POLYNOMIALS,
by Seymour V. Parter. Aug 64, 32p MRC-TSR-498
Contract DA1' 022ORD2059, Grant AF AFOSR63 381
Unclassified report

This report represents the amplification and extension of some remarks made at a conference on Toeplitz Forms at the University of Minnesota in May 1964.

Descriptors: (*Matrix algebra, Polynomials), (*Polynomials, Matrix algebra), Functions, Real numbers, Series.

The extreme eigenvalues of the truncated Toeplitz matrices associated with certain orthogonal polynomials were studied. In particular, certain comparison theorems enable one to extend the results of Hirschman for the classical orthogonal polynomials. (Author)

AD-607 820 Div. 15
OTS Prices: HC $3.00/MF $0.75

Mathematics Research Center, Univ. of Wisconsin, Madison.
GALERKIN'S PROCEDURE FOR NONLINEAR PERIODIC SYSTEMS,
by Minoru Urabe. Aug 64, 85p MRC-TSR-501
Contract DA1₁ 022ORD2059
Unclassified report

Descriptors: (*Nonlinear differential equations, Numerical analysis), (*Differential equations, Numerical analysis), Numerical methods and procedures, Boundary value problems, Oscillation, Nonlinear systems, Mapping (Transformations), Matrix algebra, Polynomials.

It is shown that Galerkin's procedure is always available for twice continuously differentiable periodic differential systems if a periodic solution is restricted to an isolated periodic solution. This gives an explicit condition for applying Galerkin's procedure and reveals the wide applicability of Galerkin's procedure to general nonlinear periodic differential systems. The proof of this result is based on existence theorems which are derived from idea contained in Newton's iterative method. The relationship of Galerkin's procedure to the method of averaging is also discussed. Finally the paper exemplifies Galerkin's procedure with a certain nonlinear equation. (Author)

AD-607 821 Div. 15
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON THE TWO POINT CONNECTION PROBLEM FOR SECOND ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS WITH POLYNOMIAL COEFFICIENTS,
by Po-Fang Hsieh and Yasutaka Sibuya. Sep 64, 40p MRC-TSR-505
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Differential equations, Polynomials), (*Polynomials, Differential equations), Power series, Series, Complex numbers, Functions.

The main interest in this paper was to study the behavior of asymptotic solutions of a linear differential equation in the large by studying the properties of asymptotic solutions with respect to (x, a sub 1, ..., a sub m).

AD-607 822 Div. 15, 8
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
OPTIMAL WINDOWS FOR POWER SPECTRA ESTIMATION,
by Donald G. Watts. Sep 64, 44p MRC-TSR-506
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Harmonic analysis, Bandwidth), (*Integral transforms, Statistical functions), Fourier analysis, Series, Time lag theory, Calculus of variations, Frequency, Control, Theory, Optimization.

Two classes of optimal spectral windows are derived. These windows are compared with empirical windows used, e.g. Bartlett, Hanning, Parzen, and are found to be generally superior to them on a mean-square-error basis. Some of the considerations of bandwidth and resolution of spectral windows are discussed and clarified. (Author)

AD-607 823 Div. 15
OTS Prices: HC $2.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
THE SPECTRA OF INFINITELY OSCILLATING POTENTIALS,
by J. B. McLeod. Sep 64, 34p MRC-TSR-507
Contract DA11 022ORD2059
Unclassified report

See also AD-607 827.

Descriptors: (*Differential equations, Harmonic analysis), (*Harmonic analysis, Differential equations), Functions, Equations, Theorems, Bessel functions, Potential theory, Mathematical analysis.

AD-607 824 Div. 15
OTS Prices: HC $3.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
NUMERICAL COMPUTATION OF NONLINEAR FORCED OSCILLATIONS BY GALERKIN'S PROCEDURE,
by Minoru Urabe and Allen Reiter. Sep 64, 52p
MRC-TSR-510
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Differential equations, Numerical analysis), (*Nonlinear differential equations, Numerical analysis), Numerical methods and procedures, Oscillation, Nonlinear systems, Fourier analysis.

The present paper is the continuation of the preceding paper (AD-607 820) by Urabe. In the paper (AD-607 820), Urabe has proved that, for any periodic differential system dx/dt=X(x,t), an isolated periodic solution lying inside the region of definition of X(x,t) can be always obtained by Galerkin's procedure if X(x,t) and its derivative with respect to x are continuously differentiable with respect to x and t. In the present paper, the practical numerical method based on this result is described and some numerical examples are presented. (Author)

15. Mathematics

AD-607 677 Div. 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ELEMENTARY THEORY OF CONVEX POLYHEDRONS,
by H. von Weyl. 17 Apr 50, 28p T-19
TT 64 71629

Unclassified report

Trans. of article from unidentified source, n. d., 26p.

Descriptors: (*Convex bodies, Theory), Geometry, Set theory, Series, Inequalities.

AD-607 706 Div. 15
OTS Prices: HC $1.00/MF $0.50

Research Triangle Inst. Durham, N. C. .
A NOTE ON CURVE-CROSSINGS BY NORMAL PROCESSES.
Technical rept. no. 2,
by M. R. Leadbetter. Oct 64, 10p SU-181
Contract Nonr4565 00

Unclassified report

Descriptors: (*Statistical processes, Curve fitting), (*Curve fitting, Statistical processes), Stochastic processes, Statistical functions, S-matrix, Probability, Series, Integration, Partial differential equations.

AD-607 755 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
IDENTIFICATION OF DIFFERENTIAL SYSTEMS WITH TIME-VARYING COEFFICIENTS,
by Richard Bellman, Brian Gluss, and Robert Roth.
Nov 64, 18p RM-4288-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Differential equations, Identification), Numerical analysis, Mathematical models, Nonlinear differential equations, Iterative methods.

Consideration is given to the problem of obtaining an optimal fit to observed data by determining successive approximating systems of linear differential equations with time-varying coefficients. This latter characteristic introduces little additional complexity in applying the differential approximation and quasilinearization methods used in the time-invariant case. Two examples are considered in order to demonstrate the method. (Author)

AD-607 794 Div. 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE INFINITE SERVER QUEUE WITH COMPOUND RENEWAL INPUT,
by Sidney C. Port. Oct 64, 33p RM-4331-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Queueing theory, Mathematical models), Operations research, Stochastic processes, Probability, Statistical processes, Inventory analysis, Scheduling.

A number of different situations which arise in various contexts can be described as realizations of the basic mathematical model of a queue with compound renewal input. This mathematical model is analyzed in general, and various special cases obtained by restricting the input or output distributions are considered. Applications to some specific situations are also indicated.

AD-607 795 Div. 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RELATIVE INVARIANTS AND CLOSURE,
by Richard Bellman and John M. Richardson. Oct 64, 14p RM-4209-ARPA
Contract SD79, ARPA Order 189 61

Unclassified report

Descriptors: (*Invariance, Equations), Power series, Series, Boundary value problems, Differential geometry, Non-linear differential equations, Differential equations.

One of the basic problems of mathematical physics is that of replacing a nonlinear functional equation by a more tractable (analytically and computationally) linear equation. More generally, one wants to replace a system of nonlinear equations, often derived from a single equation by means of an expansion in a parameter, an orthogonal expansion with a system of linear functional equations. To treat this closure problem, the authors presented a method based upon the concept of relative invariants and the use of the multidimensional Lagrange expansion theorem. (Author)

AD-607 796 Div. 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE CONVEX HULL OF A RANDOM SET OF POINTS,
by Bradley Efron. Oct 64, 32p RM-4313-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Convex sets, Probability), Theory, Stochastic processes, Transformations (Mathematics), Statistical functions, Distribution theory, Integrals, Mathematical prediction, Geometry.

Various expectations concerning the convex hull of N independently and identically distributed random points in the plane or in space were evaluated. Integral expressions were given for the expected area, expected perimeter, expected probability content, and expected number of sides. These integrals were shown to be particularly simple when the underlying distribution is normal or uniform over a disk or sphere. (Author)

AD-607 802 Div. 15
OTS Prices: HC $3.00/MF $0.75

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
BOUNDARY VALUES OF POTENTIAL FUNCTIONS PRESCRIBED ALONG INTERIOR PATHS,
by A. S. Peters. Sep 64, 59p IMM-NYU-331
Contract Nonr285 55

Unclassified report

Descriptors: (*Potential theory, Boundary value problems), (*Boundary value problems, Potential theory), Integral transforms, Difference equations, Functions.

the smaller of which is the largest possible lower limit. It must be understood that these probabilistic statements refer to the conceptual or actual results of continued sampling for which the enclosure probabilities are held constant and the differing test results give a distribution of lower and upper limits. A 'best' formula is also given which lies between the others and has a zero value of a reasonably defined average error. Use of the proposed scheme will reduce needed sample sizes as compared to usual statistical procedure in which only 'pessimistic' relations are used. (Author)

AD-607 911 Div. 15, 12, 30
OTS Prices: HC $3.00/MF $0.50

Aeronautical Research Associates of Princeton, Inc., N. J.
ON OPTIMAL CONTROL WITH BOUNDED STATE VARIABLES.
Jul 64, 54p ARAP-60
Contract Nonr3703 00, Proj. S R009 01 01, Task 102
Unclassified report

Descriptors: (*Optimization, Control), (*Calculus of variations, Control systems), Linear programming, Hamiltonian, Boundary value problems, Functional analysis, Inequalities.

This report surveys the present status of the bounded state space problem in optimal control theory. Two different methods are used to formulate the variational problem with each method providing a set of different but equivalent necessary conditions. The physical meaning of these conditions is examined along with their use in computational procedures. It is shown that the solution to the bounded state space problem requires the solution of a system of differential equations in which auxiliary conditions are specified not only at the initial and terminal points, but at each intermediate point at which the optimal trajectory enters or leaves the boundary surface. (Author)

AD-607 923 Div. 15
OTS Prices: HC $1.00/MF $0.50

Chicago Univ., Ill.
NOTE ON COHOMOLOGY ALGEBRAS OF SYMMETRIC GROUPS.
Technical note,
by Minoru Nakaoka. Jun 60, 24p
Contract AF18 600 1383, Proj. 9769C, Task 37658
AFOSR tn60 757; PB 150 059
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Groups (Mathematics), Algebras), (*Algebras, Groups (Mathematics)), (*Algebraic topology, Groups (Mathematics)), Mapping (Transformations), Prime numbers.

This is a continuation of a previous paper, and deals with mod p cohomology algebra H(*) (s(m); Z sub p) of the symmetric group S(m) of degree m, where 1 < m < infinity and p is a prime.

AD-607 931 Div. 15, 9
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles. Calif.
ON THE VANISHING OF THE CURL OF A CERTAIN VELOCITY FIELD OCCURRING IN THE THEORY OF CONSERVATIVE HOLONOMIC DYNAMICAL SYSTEMS,
by D. C. Lewis. 17 Apr 56, 9p
GM-TR-16, RW-26-30-132
Unclassified report

Descriptors: (*Differential equations, Theory), (*Dynamics, Calculus of variations), Topology, Differential geometry, Vector analysis, Velocity, Integrals, Hamiltonian, Invariance, Set theory.

AD-607 951 Div. 15
OTS Prices: HC $3.00/MF $0.75

Boeing Scientific Research Lab., Seattle, Wash.
CONVEX POLYTOPES AND LINEAR PROGRAMMING.
Mathematical note,
by Victor Klee. Aug '64, 88p
D1-82-0374, Boeing-Math-366
Unclassified report

Also available from the author.

Descriptors: (*Linear programming, Convex sets), (*Convex sets, Linear programming), Topology, Geometry, Theorems.

The report contains a survey of past discoveries and current knowledge concerning the facial structure of convex polytopes, including some connections with linear programming. Details of proofs are considered unimportant; instead, reliance is placed on statements of definitions and theorems and on references to the literature, along with an account of unsolved problems and a few historical remarks. The section headings are as follows: 1. Four landmarks; 2. Polytopal d-tuples; 3. Polytopal graphs; 4. Paths in polytopes; 5. Additional results and problems. Bibliographic notes are included in each section. They refer to the list of more than a hundred publications which appears at the end of the paper.

AD-607 976 Div. 15
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
RATIO LIMIT THEOREMS FOR MARKOV CHAINS,
by Sidney C. Port. Nov 64, 60p RM-3995-PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Stochastic processes, Theory), (*Measure theory, Probability), (*Probability, Measure theory), Statistical processes, Matrix algebra, Integrals, Set theory, Series, Green's function.

In an irreducible, recurrent, Markov chain, with integer states, let N sub n(A) be the occupation time of A by time n, where A is a finite set of states. The principal concern in this memorandum was to investigate various 'ratio limit theorems' for P sub x(N sub n(A) =k). Criteria were given for various ratio limits to exist. The limits (when they exist) were shown to be expressible in terms of an integral over the set of integers E completed with its dual recurrent boundary B. Applications were given to several specific Markov chains. (Author)

AD-607 825 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON THE CONVERGENCE OF FORMAL SOLUTIONS OF SYSTEMS OF LINEAR ORDINARY DIFFERENTIAL EQUATIONS CONTAINING A PARAMETER,
by Yasutaka Sibuya. Sep 64, 15p MRC-TSR-511
Contract DA11 022ORD2059
Unclassified report

Descriptors: (*Differential equations, Theory), Sequences, Complex variables, Complex numbers, Functional analysis, Power series, Series, Perturbation theory.

The is a study of the convergence of formal solutions of linear non-homogeneous ordinary differential equations in the case of singular perturbations.

AD-607 826 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
SOME GLOBAL PROPERTIES OF MATRICES OF FUNCTIONS OF ONE VARIABLE,
by Yasutaka Sibuya. Sep 64, 25p MRC-TSR-512
Contract DA11 022ORD2059 Unclassified report

Descriptors: (*Matrix algebra, Functions), (*Functions, Matrix algebra), Complex variables, Differential equations, Polynomials, Theorems.

This paper contains global block-diagonalization theorems for the matrices of analytic functions as well as periodic functions. (Author)

AD-607 827 Div. 15
OTS Prices: HC $1.00/MF $0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
THE SPECTRA OF INFINITELY OSCILLATING POTENTIALS II,
by J. B. McLeod. Sep 64, 14p MRC-TSR-514
Contract DA11 022ORD2059
Unclassified report

See also AD-607 823.

Descriptors: (*Differential equations, Harmonic analysis), (*Harmonic analysis, Differential equations), Functions, Potential theory, Theorems, Analysis of variance, Boundary value problems.

The paper studies the spectrum of the differential equation

$$\frac{d^2y}{dx^2} + \quad - q(x) \quad y = 0 \quad (0 < x < \quad),$$

where q(x) = h(x)g(x) and, roughly, h(x) is an increasing function and g(x) is periodic. With various 'smoothness' conditions on h(x), g(x), the spectrum associated with (1) and a homogeneous boundary condition at x = 0 is proved to be discrete, with limit-points at ± . This improves an earlier result by removing an awkward restriction. The result applies to functions of the type x sin x (> 0). (Autho

AD-607 897 Div. 15
OTS Prices: HC $4.00/MF $0.75

Courant Inst. of Mathematical Sciences, New York Univ., N. Y.
ON INVARIANT SURFACES AND BIFURCATION OF PERIODIC SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS,
by Robert John Sacker. Oct 64, 105p IMM-NYU 333
Contract Nonr285 46
Unclassified report

Supported in part by the National Science Foundation and the Sloan Foundation.

Descriptors: (*Differential equations, Perturbation theory), (*Perturbation theory, Differential equations), Invariance, Vector analysis, Mapping (Transformations), Differential geometry, Equations, Functions.

AD-607 907 Div. 15
OTS Prices: HC $6.00/MF $1.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COURSE ON THE CALCULUS OF VARIATIONS, 2D ED,
by M. A. Lavrent'ev and L. A. Lyusternik. 20 Oct 64, 296p
FTD TT64 651; TT 64 71650
Unclassified report

Unedited rough draft trans. of mono. Kurs Variatsionnogo Ischisleniya, 2d ed., Moscow/Leningrad, 1950, 296p.

Descriptors: (*Calculus of variations, Textbooks), (*Textbooks, Calculus of variations), Complex variables, Partial differential equations, Functional analysis, Transformations (Mathematics), Mathematics, USSR.

Contents: Elementary solution methods for extremum problems; Method of variations; Generalizations of the elementary problem; Admissible curves with moving end points. Discontinuous problems; Conditional extremum; Variational problems in parametric form; Field theory; Sufficient conditions for strong and weak expressions; Linear variational problems; Minimax problems.

AD-607 909 Div. 15
OTS Prices: HC $3.00/MF $0.75

Air Force Weapons Lab., Kirtland AFB, N. Mex.
SAMPLING FOR RELIABILITY DETERMINATION, AN IMPROVED SCHEME.
Rept. for May-Sep 64,
by W. C. Beckham. Oct 64, 65p
WL TR64 116
Unclassified report

Descriptors: (*Sampling, Reliability), Probability, Differential equations, Errors, Statistical processes.

A unique solution is presented for the ancient sampling problem posed as follows: One is to test a finite random sample from a large population for some property that an unknown fraction of the population possesses. Required: To deduce the most accurate possible probabilistic statements in the following sense. For a specified probability that the unknown fraction be larger than some lower limit, calculate from the test result the largest possible lower limit that will have at least this probability and the smallest possible upper limit that will have at most this probability. Similarly, specify narrowest possible ranges for upper limits. These formulas can then be applied to determine for specified lower and upper limits two probabilities for their enclosure of the unknown fraction, the larger of which is the lowest possible upper limit and

conditions of sinusoidal vibration. Results are presented which show that frequency analysis of the waveform does not yield the desired displacement information due to lack of physiological standardization. A proposed method of extending Ernest Frank's mirror image cancellation method to vibration problems by using time sampling and computer data reduction is presented. (Author)

AD-607 540 Div. 16
OTS Prices: HC $1.00/MF $0.50

Naval Medical Research Inst., Bethesda, Md.
SOLUBLE PROTEINS OF FRESH HUMAN BONE AND DENTIN.
Research rept. no. 8,
by K. C. Hoerman, S. A. Mancewicz, V. J. Berzinskas, and R. B. Caldwell. 10 Mar 64, 6p
Proj. MR005 12 5000 02

Unclassified report

Descriptors: (*Bone, Proteins), (*Proteins, Bone), Albumins, Globulins, Blood proteins, Teeth, Ethylenediamine, Mucopolysaccharides, Calcification, Collagen, Tissues (Biology), Solubility.

Albumin and beta globulin (transferrin) were present and easily extracted from fresh human bone and dentin chips. Other normal blood proteins were absent. Ethylenediaminetetraacetic acid (EDTA) removed additionally 1 mucopolysaccharide and 3 protein fractions. These components were considered indigenous to the calcified tissues. Collagen or collagen-like organic matrices are freed of extraneous proteins during demineralization with EDTA. (Author)

AD-607 542 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ADRENALIN-LIKE SUBSTANCES AND BIOLOGICAL ACTIVITY OF THE BLOOD IN CERTAIN FORMS OF NERVOUS PATHOLOGY,
by G. N. Kassil', E. A. Matlina, and R. A. Sokolinskaya. 6 Oct 64, 21p
FTD TT63 1170; TT 64 71615

Unclassified report

Trans. of Problemy Endokrinologii i Gormonoterapii (USSR) 1959, v. 5, no. 1, p. 70-79.

Descriptors: (*Autonomic nervous system, Pathology), (*Nervous system diseases, Blood chemistry), Physiology, Epinesphrine, Vasoactive agents, Colorimetric analysis, Ascorbic acid, Biochemistry, USSR.

1. Determination of various forms of axrenalin like substances (adrenalin, dehydroform, chromogens) together with the study of bioligical (sympathic and parasympathic) activity of the blood at physiological and certain pathological states of the organism offers the known idea about the tonus and reactance of various branches of the vegetative nervous system. 2. The content of adrenalin like substances and the level of biological activity of the blood vary in broad intervals in norm and in pathology as well. 3. The high level of adrenalin like substances and sympathic activity of the blood is noticed in cases of diseases, accompanied with painful syndrome, at certain forms of diencephalic pathology and at Addison's disease. 4. Low level of adrenalin like substances of the blood was observed at myasthenia. An improvement in the patients states, patients suffering from myasthenia, caused by proserine, is connected not only with changes in acetylcholine exchange, but also with the rise in level of adrenalin like substances and with the increase in sympathetic activity of the blood. 5. In each individual case is necessary to separate the primary pathological process and compensation phenomena (homeostatic reactions, intended for preservation of relative constancy of inner medium.

AD-607 563 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
EFFECT OF IONIZING RADIATION ON THE LEVEL OF HISTAMINE IN THE TISSUES AND ITS SIGNIFICANCE IN EARLY RADIATION DAMAGE TO THE HISTOHEMATIC BARRIERS,
by E. I. Krichevskaya and G. V. Kapitonova.
15 Oct 64, 20p
FTD TT64 644; TT 64 71607

Unclassified report

Unedited rough draft trans. of mono. Gisto-Gematicheskie Bar'ery (Histohematic Barriers) Trudy Soveshchaniya, Moscow, 25-28 May 60, 1961, p. 48-56.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Radiation effects, Histamine), (*Histamine, Radiation effects), Tissues (Biology), Radiation damage, Radiation sickness, Radiological dosage, Nervous system, Diamine oxidase, Antihistaminics, Liver, Kidneys, Skin, Anesthesia, Biochemistry, Rats, USSR.

The humoral factors which determine the functional state of the histohematic barriers are discussed. The present study is devoted to the study of one of them--histamine, which plays an essential role in the breakdown of the capillary penetrability in different kinds of pathological conditions.

AD-607 603 Div. 16
OTS Prices: HC $1.00/MF $0.50

Kentucky Univ., Lexington.
THE EFFECTS OF IMMERSION OF THE HAND IN COLD WATER ON DIGITAL BLOOD FLOWS,
by A. C. L. Hsieh, T. Nagasaka, and L. D. Carlson.
Mar 64, 16p
Contract AF41 657 335, Proj. 8237, Task 823702
AAL TDR63 35

Unclassified report

Descriptors: (*Hands, Low-temperature research), (*Blood circulation, Low-temperature research), (*Low-temperature research, Blood circulation), Temperature, Water, Ice, Body temperature, Blood vessels, Exposure, Skin, Equations.

The temperatures of the tip of the middle fingers (Ts) of nine comfortably warm subjects have been recorded during immersion of all the fingers of one hand in a 27 liter bath containing slowly stirred water at temperatures ranging from 4.6 to 40C (Tw). Blood flow (F = ml/sq cm/min) was estimated from the average Ts for the last 15 minutes of a 20-minute period, Tw and body temperature (Tb) by using the equation: $F = 1087 \times K(Ts - Tw)/(Tb - Ts)$. ($K = 0.0134$ kcal/sq. cm/min/C). The increase in F per C reduction in Tw below 10C was 0.16 ± 0.077 ($P<.05$). This value gives a measure of the vasodilatation occasioned by immersion in water below 10C. The sample regression equation of F on Tw was: $F = 4.1 - .16\ Tw \pm 0.17$ ($n = 27$; range of Tw = 4.6 to 10C). This method of estimating blood flow at several levels

16. Medical Sciences

AD-607 461 Div. 16, 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON THE IDENTIFICATION OF SYSTEMS AND THE UNSCRAMBLING OF DATA: SOME PROBLEMS SUGGESTED BY NEUROPHYSIOLOGY,
by Richard Bellman, Brian Gluss, and Robert Roth.
Oct 64, 11p RM-4266-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Nervous system, Dynamic programming), (*Dynamic programming, Nervous system), Mathematics, Differential equations, Input-output devices, Physiology.

It is shown that mathematical techniques of quasilinearization and dynamic programming may be applied to the problem of determining the structure of a system with partially known inputs and partially observable outputs. In particular, this method may have important implications concerning research on the structure of the human nervous system. (Author)

AD-607 482 Div. 16
OTS Prices: HC $5.00/MF $1.00

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COUNTERROLLING OF THE HUMAN EYE.
Master's thesis,
by Richard J. Flaherty and Gary K. Pritchard. Aug 64, 158p
AFIT GE/EE/64 8

Unclassified report

Descriptors: (*Eye, Roll), Rotation, Adaptation (Physiology), Head, Measurement, Statics, Dynamics.

Counterrolling is a conjugate rolling movement of the eye around the line of sight opposite to the lateral inclination of the head. Measurements of counterrolling were obtained for four subjects (three normal and one labyrinthine defective) for static positions of lateral head (body) tilt and for vertical rotation in the frontal plane at constant rates up to 30 rpm. A specially designed rotating chair and cine photographic technique were used. The measured static counterrolling responses compared favorably with those obtained by other investigators. The dynamic counterroling responses were similar to the static responses except for a constant time lag of 1/3 second and a decrease in amplitude. (Author)

AD-607 486 Div. 16
OTS Prices: HC $1.00/MF $0.50

IIT Research Inst., Chicago, Ill.
DEVELOPMENT OF AN ORALLY EFFECTIVE INSECT REPELLENT.
Quarterly progress rept. for 1 Aug-31 Oct 64,
by Harbans Lal. 31 Oct 64, 11p IITRI-C222-10
Contract DA49 193MD2281, Proj. C222

Unclassified report

Descriptors: (*Insect repellants, Effectiveness), (*Culicidae, Insect repellants), Adenosine phosphates, Mouth, Organic compounds, Blood, Pest control.

The object of the program is the development of an insect repellent which is effective when administered internally. During the period covered, unexpected deaths occurred in the mosquito colony and resulted in considerable loss of time. The procedures for raising mosquitoes and maintaining the colony were thoroughly reviewed. Studies were initiated on chemically induced feeding behavior of mosquitoes through an animal membrane. It was confirmed that adenosine triphosphate induced feeding response in mosquitos. (Author)

AD-607 532 Div. 16, 10, 28
OTS Prices: HC $3.00/MF $0.50

Aerospace Medical Research Labs (6570th), Wright-Patterson AFB, Ohio.
THE EFFECT OF DECABORANE INJECTION ON MACACA MULATTA AND MACACA IRUS OPERANT BEHAVIOR.
Final rept. for 10 Feb-24 Feb 64,
by Herbert H. Reynolds, Henry W. Brunson, Kenneth C. Back, and Anthony A. Thomas. Aug 64, 52p
Proj. 6302, Task 630202
AMRL TDR64 74

Unclassified report

Prepared in cooperation with Aerospace Medical Labs. (6571st), Holloman AFB, New Mex.

Descriptors: (*Decaboranes, Toxicology), (*Monkeys, Behavior), Fuels, Hazards, Pharmacology, Injection (Medicine), Psychophysiology, Learning.

Ten adult monkeys, eight on negatively reinforced (low level shock) tasks and two on positively reinforced (food reward) tasks, were injected with either 2 mg, 4 mg, or 1 mg followed by 2 mg decaborane per kg body weight, and their performance on various operant tasks was compared with baseline performance. All animals exhibited a performance decrement on at least one task, with 75% of the subjects exhibiting a decrement on the remaining tasks. In over half the cases performance changes preceded clinical symptoms. There was no significant difference between the 2 mg and 4 mg exposures when a subject showed a decrement on negatively reinforced tasks. However, those subjects that received 1 mg followed the next day by 2 mg (positively reinforced animals) did not noticeably improve or return to baseline for a much longer period than the 2 mg and 4 mg groups (negatively reinforced). (Author)

AD-607 534 Div. 16
OTS Prices: HC $3.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION OF THE APPLICATION OF SPATIAL VECTORELECTROCARDIOGRAPHY TO PROBLEMS OF CENTRAL CARDIOVASCULAR SYSTEM CONSTRAINT.
Master's thesis,
by David Clifford Westhorp. Aug 64, 58p
AFIT GE/EE/64 23

Unclassified report

Descriptors: (*Electrocardiography, Vibration), (*Vibration, Electrocardiography), (*Cardiovascular system, Vibration), Heart, Tissues (Biology), Muscles, Amplitude modulation, Electrical properties, Acceleration, Equations, Mathematical models.

The purpose of this study was to investigate methods to determine heart position under conditions of vibration by using vectorelectrocardiographic techniques. An experiment to validate a theory is described, based on conductivity inhomogeneities of tissues surrounding the heart and proposing amplitude modulation of electrocardiographic waveform frequency components under

AD-607 758 Div. 16
OTS Prices: HC $2.00/MF $0.50

Chicago Univ., Ill. Medical School.
BODY TISSUE CHANGES IN DOGS RESULTING FROM SINUSOIDAL OSCILLATION STRESS.
Final rept. for Mar 60-Dec 62,
by John L. Nickerson and Anna Paradijeff. Aug 64, 31p
Contract AF33 616 7053, Proj. 7231, Task 723101
AMRL TDR64 58

Unclassified report

Descriptors: (*Vibration, Tissues (Biology)), (*Tissues (Biology), Vibration), Oscillation, Stress (Physiology), Pathology, Histological techniques, Blood analysis, Urine, Kidneys, Blood cells, Lymphocytes, Hemorrhage, Infections, Body temperature.

Tissue damage resulting from varying frequency, amplitude, and duration of sinusoidal vibration is discussed. Gross post-mortem and histological observations and, in some cases, routine clinical studies of blood and urine were made. The organs found most liable to damage with vibration at 4 cps as evidenced by hemorrhage observed in histological studies were kidney, mid-brain pons, heart, lungs, and liver with less effect upon the urinary bladder, medulla, rectum, and trachea. At the higher frequencies the pituitary, stomach, duodenum, pancreas, and the mid-brain also showed change. The adrenal, spleen, and sections of artery showed no histologic evidence of hemorrhage in the tests performed. Tearing occurred in soft tissues. No ligaments showed damage. Blood cell changes appeared, specifically hyperlobulation in the polynuclear neutrophils, inhomogeneities, and the appearance of intranuclear vacuoles in the nucleus of the lymphocytes. Of the 21 percent which died, most had an additional stress resulting from infection or previous renal damage. Hyperthermia appeared to be a contributing cause of the physiological changes in these tests. (Author)

AD-607 759 Div. 16
OTS Prices: HC $3.00/MF $0.50

Ionics, Inc., Cambridge, Mass.
RECOVERY OF POTABLE WATER FROM URINE BY MEMBRANE PERMEATION.
Final rept. for May 63-Apr 64,
by Arthur W. Warner, Daniel L. Brown, and Werner Glass. Sep 64, 53p
Contract AF33 657 11353, Proj. 6373, Task 637304
AMRL TDR64 73

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Urine, Purification), (*Closed ecological systems, Water), (*Water, Life support), Membranes, Permeability, Models (Simulations), Laboratory equipment, Feasibility studies, Space medicine, Cellulose acetates, Ion exchange, Carbon, Absorption, Ammonium compounds, Recovery.

An experimental program was conducted to determine the feasibility of using membrane permeation for the reclamation of potable water from human urine. On the basis of favorable results obtained in the feasibility study, a laboratory-model urine reclamation system was built. Model components selected were theoretically capable of operating in a zero-gravity environment to recover 5000 milliliters of water per 24-hour period. The laboratory model weighs about 128.5 pounds, has a total component volume of about 2.0 cubic feet, and requires approximately 262 watts of power to operate. Energy requirement of the system is about 4.4 kilowatt hours per 5000 ml of product. Excellent quality water is obtained from the system, using raw human urine as the feed source. Yields are above 85%. (Author)

AD-607 878 Div. 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CHANGES IN THE CONTENT OF BIOLOGICALLY ACTIVE SUBSTANCES IN RATS UNDER THE ACTION OF RADIAL ACCELERATIONS,
by I. M. Khazen and I. L. Vaisfel'd. 17 Aug 64, 14p
FTD TT64 202; TT 64 71642

Unclassified report

Unedited rough draft trans. of Voprosy Meditsinskoi Khimii (USSR) 1962, v. 8, no. 5, p. 493-497.

Descriptors: (*Acceleration tolerance, Biochemistry), (*Biochemistry, Acceleration tolerance), (*Histamine, Acceleration tolerance), Membranes (Biology), Intestines, Lungs, Brain, Tissues (Biology), Urine, Mucus, Pathology, Serotonin, Acetylcholine, Cholinesterase, Central nervous system, Blood analysis, Morphology (Biology), USSR.

In rats after repeated action of positive radial acceleration, the content of histamine increases in the mucous membrane of the intestine, and decreases considerably in the lungs and tissues of the brain. In the tissues investigated, there is an increase in the activeness of the dynamoxydase, and also in the adrenalin-like substances, especially in the lungs and the brain tissue. After a single action of negative accelerations in the tissues investigated, there is a lowering of the content of histamine and the activeness of the dynamoxydase, the content of adrenalin-like substances decreases in the mucous membrane of the intestine, and in the tissues of the brain, and in the lungs no change is noted. After multiple and often repeated action of positive accelerations in the investigated tissue, there is also a lowering of the histamine and content of adrenalin-like substances in the mucous membrane of the intestine and in the tissues of the brain. Under different conditions of the experiment there is a reduction in the excretion of 5-oxyindoluxus acid with the urine, whereby, the change in the excretion of acid also occurs with a definite dependence on the magnitude, the frequency and duration of the action. (Author)

AD-607 904 Div. 16
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
HANDBOOK OF MEDICAL INSTRUMENTS,
by A. G. Kreitser. 13 Aug 64, 256p
FTD TT63 1059; TT 64 71647

Unclassified report

Unedited rough draft trans. of mono. Spravochnik po Meditsinskim Priboram, Leningrad, 1962, 196p.

Descriptors: (*Medical equipment, Handbooks), Electrocardiography, Ballistocardiography, Electroencephalography, Oscilloscopes, Manometers, Gas analysis, Optical analysis, Colorimetric analysis, Photometers, Spectrophotometers, Laboratory equipment.

Data on diagnostic and measuring equipment used in clinical laboratory tests are collocated in the manual.

of Tw describes more fully the peripheral circulatory response to cold than methods in which only one level of Tw is used. (Author)

AD-607 703 Div. 16
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
STUDY OF THE INFLUENCE OF ROTATORY STIMULATION UPON RESPIRATION,
by Masami Usami. Sep 64, 24p
DSIS T84J; TT 64 25481

Unclassified report

Trans. of Nihon Jibi Inkoka Gakkai Kaiho (Japan) 1962, v. 65, no. 5, p. 662-671.
Also available from NRC.

Descriptors: (*Rotation, Respiration), (*Respiration, Rotation), Stimulation, Ear, Vestibular apparatus, Reflexes, Autonomic nervous system, Japan.

The reactions evoked by labyrinthine stimulation involve vestibulo-ocular reflexes, vestibulo-spinal reflexes and vestibulo-autonomic reflexes. By taking into account these three relationships, it would seem to be in some measure possible to diagnose the region of a lesion. Wodak (1956) has systematically studied, in 118 subjects, vestibulo-autonomic reactions (pallor, nausea, vomiting, etc), vestibulo-spinal reflex (the deviation reaction) and vestibulo-ocular reflex (caloric nystagmus) and has applied them in clinical diagnosis. But generally speaking the prime object, in rotatory and caloric examination, has been only the observation of nystagmus; as regards respiratory, changes, blood pressure changes and changes in muscular tonus of the limbs, it does not appear that any conscientious observations are being made. The author has therefore observed respiratory changes while rotational nystagmus was appearing in human subjects and in animals, and has considered what physiological and clinical significance these changes may have. (Author)

AD-607 705 Div. 16
OTS Prices: HC $1.00/MF $0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
ON THE STATE OF THE CARDIOVASCULAR SYSTEM UNDER CONDITIONS OF EXPOSURE TO CONTINUOUS NOISE,
by N. N. Shatalov, A. O. Saitanov, and K. V. Glotova.
Sep 64, 6p
DSIS T411R; TT 64 25480

Unclassified report

Trans. of Gigiena Truda i Professional 'nye Zabolevaniya (USSR) 1962, v. 6, no. 7, p. 10-14.
Also available from NRC.

Descriptors: (*Noise, Cardiovascular system), (*Cardiovascular system, Noise), Industrial medicine, Blood pressure, Pathology, Heart, Artherosclerosis, Electrocardiography, USSR.

The mechanization and automation of many industrial processes often involves intense noise. According to available data in the literature, noise has a deleterious effect upon, primarily, the state of hearing and the nervous system. Depending on the nature of the industrial noise and the duration of work under conditions of noise exposure auditory impairment may develop to the point of 'hardness of hearing'. Since the state of the cardiovascular system in persons working under conditions of industrial noise is a question of important theoretical and practical interest, and one that is still inadequately examined, a study was made of two groups of workers subjected to the influence of continuous noise.

AD-607 718 Div. 16, 20
OTS Prices: HC $1.00/MF $0.50

Naval Training Device Center, Port Washington, N. Y.
BIOLOGICAL EFFECTS OF LASERS: SAFETY RECOMMENDATIONS AND A COMMENT ON THE CONCEPT OF OCULAR DAMAGE.
Technical rept.,
by Paul A. Cirincione. 28 Jul 64, 15p
NAVTRADEVCEN IH15

Unclassified report

This paper was presented at the Annual Conference on the Biologic Effects of Laser Radiation (1 st), held at the Armed Forces Institute of Pathology, Walter Reed Army Hospital, Washington, D. C., 30 Apr-1 May 64.

Descriptors: (*Lasers, Burns), (*Safety, Lasers), Vision, Eye, Safety, Ophthalmology, Blindness, Retina, Tissues (Biology), Necrosis, Skin, Pathology, Humans, Eyeglasses.

The biological effects of laser radiation are discussed with particular emphasis on ocular damage. Since lasers are being employed with increasing frequency, and since a safety hazard exists, specific safety recommendations are made. A behavioral assessment of visual impairment in addition to histological or ophthalmological measurement of damage is discussed and the advantages of such assessment described. (Author)

AD-607 741 Div. 16, 30
OTS Prices: HC $6.00/MF $1.25

Kollsman Instrument Corp., Elmhurst, N.Y.
BIO-INSTRUMENTATION FOR CONTROL OF PRESSURE CHAMBERS,
by M. Chodes. 10 Aug 64, 206p
Contract N61339 1182
NAVTRADEVCEN 1182 5

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Altitude chambers, Instrumentation), (*Instrumentation, Safety devices), Environmental tests, Physiology, Measurement, Warning systems, Hazards, Operation, Installation, Maintenance, Mechanical drawings, Control systems, Handbooks.

The bio-instrumentation for control of pressure chambers is designed to monitor the environment within altitude-simulation chambers and alert the chamber operator to the existence of conditions that are hazardous to the chamber occupants. Specifically, the instrumentation continuously monitors and displays the following: percent oxygen, percent carbon dioxide, percent carbon monoxide, temperature, humidity, pressure/altitude, and duration of exposure. This report provides a complete description of the bio-instrumentation, in terms of the system as a whole and of the individual components and subsystems. The results of the physiological investigations are included. The report contains detailed procedures for installing, calibrating, and operating the instrumentation, and for performing preventive maintenance.

beta activities from sticky trays were 5.3. and 8.7 x 10 to the -4th power microcuries per sq. ft. of surface, respectively. Maximum gamma plus beta reading from portable-instrument monitoring was 50 mrad/hr in air at the drill-rig casing Dec 17. Results from gamma remote monitoring, area-film-badge analysis and personnel dosimetry were negative. Maximum iodine 131 activity measured from filters in air samplers showed 7.2 x 10 to the -3d power microcuries per cu m of air during the period Nov 29 to Dec 1. Xenon was released through the vent-line exhaust at 21 and 92 curies for xenon 131m and 133, respectively.

The handbook is designed for use by a broad range of men working in medical and related sciences. The compilation and systematic presentation of material is done on a level accessible not only to physicians, physiologists and biochemists but also to medical technicians handling the equipment. The nature of exposition varies accordingly from one chapter to another. Widely used equipment such as the simplest electrocardiographs is described in popular terms. The electroencephalograph, spectrophotometer and other highly specialized instruments are described briefly, since such equipment is handled by trained technicians with adequate knowledge of the relevant physical sciences.

AD-607 905 Div. 16
OTS Prices: HC $7.00/MF $1.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
BIOSYNTHESIS OF PROTEIN,
by M. F. Gulyi. 5 Aug 64, 324p
FTD tt63 1219; TT 64 71648

Unclassified report

Unedited rough draft trans. of mono. Biosintez Belka, Kiev, 1963, 204p.

Descriptors: (*Biosynthesis, Proteins), (*Proteins, Biosynthesis), Textbooks, USSR, Enzymes, Ribonucleic acids, Nucleic acids, Nucleotides, Desoxyribonucleic acids, Amino acids, Microsomes.

Contents: On the role of proteolytic enzymes in protein biosynthesis; Biosynthesis of protein coupled with other processes as energy sources; Soluble ribonucleic acid and its role in protein biosynthesis; Connection between the acceptance of activated amino acids and nucleotides by soluble RNA; Microsomes and their role in protein biosynthesis; Messenger ribonucleic acid and its participation in protein biosynthesis; On other additional functions of nucleic acids in protein biosynthesis; Intermediates in protein biosynthesis; On the mutual relationship between protein biosynthesis and nucleic acids; On the participation of lipids in protein biosynthesis; On the nonenzymatic incorporation of amino acids into proteins; Achievement in the domain of biology and problems of methodology.

AD-607 952 Div. 16, 20
OTS Prices: HC $4.00/MF $1.00

USAF Radiation Lab., Univ. of Chicago, Ill.
QUARTERLY PROGRESS REPORT NO. 53 THE EFFECTS OF IONIZING RADIATION AND RADIATION PROTECTIVE AGENTS ON THE BIOCHEMISTRY OF MAMMALIAN TISSUES
15 Oct 64, 142p
Contract AF41 609 1693, Proj. 7757, Task 775702

Unclassified report

The original document contains color, but distribution copies are available in black-and-white reproduction only.

Descriptors: (*Radiobiology, Tissues (Biology), (*Tissues (Biology), Radiation effects), (*Radioprotective agents, Biochemistry), X rays, Enzymes, Liver, Thiols, Rats, Steroids, Radiation injuries, Lethal dosage, Aromatic compounds, Gamma rays, Fast neutrons, Life span.

Contents: Influence of X-radiation and Various Chemical Agents on the Development of a Thiophosphate-Oxidizing Enzyme System in the Livers of Male Rats; The Influence of X-radiation and Castration on Steroid-Induced Increases in the Activity of a Detoxification Enzyme in the Liver of Rats; Development and Application of a Quantitative Method for Measuring the Inhibitory Effects of X-ray on Synthesis of Microsomal Enzymes; The Influence of Various Chemical Compounds on Radiation Lethality in Mice; Dose-Mortality Relationships for Several Radioprotective Agents; Studies on the Toxicity and Mechanism of Action of Mercaptoethylamine (MEA); Further Studies on the Radioprotective Action of Sodium Nitrite in Mice; Summary of the Chronic Gamma and Low Level Fast Neutron Irradiation Program; Histological Findings in the Tissues of Mice Serially Sacrificed After Feeding a Diet Containing Para-aminopropiophenone.

AD-607 953 Div. 16, 20
OTS Prices: HC $2.00/MF $0.75

Southwestern Radiological Health Lab., Las Vegas, Nev.
OFF-SITE SURVEILLANCE.
Final rept.,
by George W. Niles. 1 Sep 64, 36p
ARPA VUF1009

Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63.

Descriptors: (*Radiological contamination, Radiation monitors), (*Radiation hazards, Health physics), Radioactivity, Nuclear explosions, Fission products, Water, Milk, Air, Dosimeters, Population, Radiation effects, Radiochemistry, Measurement.

Project Shoal, which took place at a location near Fallon, Nevada on October 26, 1963 at 1000 PDT, was an underground nuclear detonation conducted as a part of the Vela program of the Department of Defense. The Off-Site Radiological Safety Program of the U. S. Public Health Service's Southwestern Radiological Health Laboratory monitored the public area surrounding the site and collected and analyzed several hundred water, milk, and air samples before and for several weeks after the event. Analysis of these samples indicated that the radioactive material from the Shoal event was completely contained. During post-shot drilling operations an intermittant release of gaseous material containing fresh fission products occurred, but was not detected on air samplers located in populated areas or in milk and water samples taken since that time. (Author)

AD-607 966 Div. 16
OTS Prices: HC $2.00/MF $0.50

Reynolds Electrical and Engineering Co., Inc., Mercury, Nev.
ON-SITE HEALTH-AND-SAFETY REPORT.
Final rept.,
comp. and ed. by Bernard F. Eubank and Alan W. Ward.
Jun 64, 41p
Contract AT29 2 162
ARPA VUF1012

Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63.

Descriptors: (*Radiation damage, Nuclear explosion damage), (*Nuclear explosion damage, Radiation damage), Underground tests, Nevada, Radioactive fallout, Alpha particles, Beta particles, Gamma rays, Iodine, Xenon.

Project Shoal was an underground nuclear test detonated near Fallon, Nevada, on Oct 26, 1963. Radiation at shot time was completely contained; released amounts during postshot drilling were negligible. Maximum alpha and

dimpling tests on 0.010- and 0.020-inch sheet to produce 0.125-, 0.156- and 0.187-inch diameter dimples at 1200 F to 1850 F using a resistance-heated, triple-action dimpler were unsuccessful. Forming trials were conducted on the deep drawing of 0.06- and 0.100-inch RMSP tungsten cups using progressive drawing techniques with a two-stage, single-action die. The results of these studies indicate that small deep-drawn cups can be produced from tungsten sheet using multi-stage, single-action dies. The joining of tungsten sheet by resistance spot weld brazing with interleaves of 0.002-inch tantalum and molybdenum foils was evaluated. This method of joining tungsten sheet is currently not considered to be a satisfactory joining technique for obtaining crack free joints for structural applications. The platinum/boron reactive braze system was investigated to determine its suitability for joining RMSP tungsten sheet. Mechanical joining of tungsten sheet using tungsten rivets was attempted. Impacting of the rivet material at elevated temperatures was successful in producing tungsten rivets.

AD-607 682 Div. 17, 26
OTS Prices: HC $4.00/MF $1.00

Pressure Technology Corp. of America, Woodbridge, N. J.
RESEARCH ON HYDROSTATIC EXTRUSION OF THE TZM ALLOY AT AMBIENT TEMPERATURE.
Rept. for 1 May-1 Nov 63,
by A. Bobrowsky and E. A. Stack. Jun 64, 130p
Contract AF33 657 11236, Proj. 7351, Task 735103
ML TDR64 205

Unclassified report

Descriptors: (*Molybdenum alloys, Extrusion), (*Extrusion, Molybdenum alloys), Titanium alloys, Zirconium alloys, Carbon alloys, Tensile properties, Compressive properties, Hydrostatic pressure, Temperature, Heat treatment, Microstructure, Mechanical properties, Deformation.

Tensile tests and compressive tests under pressures up to 450,000 psi on TZM mlybdenum alloy, at room temperature, provided data on yield point, ultimate tensile strength, and ductility as a function of environmental fluid pressure. These data in turn indicate the initial feasibility of metalworking under pressure at room temperature without cracking or fracture. The specific metalworking process chosen was fluid-to-fluid extrusion. The fulid-to-fluid extrusion of TZM molybdenum alloy was conducted at room temperature at pressures up to 450,000 psi. It was determined that any of several fluids were suitable as the extrusion medium. Excellent finishes could be obtained even from rough-surface billets. Reductions in area up to 4:1 were made without fracture, although it is believed that much larger reductions are feasible. The experimental work was conducted on TZM molybdenum alloy in the forms of stress-relieved, recrystallized, and as-cast material. It was found that stress-relieved material actually was in a state of high residual stress. Techniques were developed for eliminating the difficulties caused by these stresses. (Author)

AD-607 729 Div. 17, 26
OTS Prices: HC $2.00/MF $0.50

ManLabs, Inc., Cambridge, Mass.
THERMOMECHANICAL TREATMENTS APPLIED TO ULTRA-HIGH STRENGTH STEELS.
Progress rept. no. 2,
by D. Kalish and S. A. Kulin. Sep 64, 43p
Contract NOw64 0356c

Unclassified report

Descriptors: (*Steel, Toughness), (*Heat treatment, Steel), Mechanical working, Carbon alloys, Nickel alloys, Cobalt alloys, Transition temperature, Fracture (Mechanics), Temperature, Transformations, Martensite, Microstructure, Strain (Mechanics), Bainite, Austenite, Deformation, Electron diffraction analysis, X-ray diffraction analysis, Tensile properties.

A 0.45% C, 9% Ni, 4% Co alloy steel is being used to study the effect of thermomechanical treatments on high strength steels with particular interest in fracture toughness. It was found that austenite deformation narrows the metastable austenite bay region with respect to both transformation time and temperature. The A sub 1 temperature of this steel was found to be approximately 1225 F. Fifty percent austenite deformation lowers the Ms temperature by 10 F, but does not significantly alter the range of temperatures over which the bainite reaction occurs. Electron and X-ray diffraction techniques have been employed to locate the various stages of tempering. A marked increase in fracture toughness occurs over a narrow tempering temperature interval as the carbide in the martensite changes from epsilonto cementite. Subcooling of this alloy is necessary in order to reduce the retained austenite content which has a substantial effect on the mechanical properties. Strain-tempering treatments improve the strength of martensitic and bainitic structures but decrease the fracture toughness.

AD-607 789 Div. 17, 26
OTS Prices: HC $5.00/MF $1.00

Rocketdyne, Canoga Park, Calif.
STRENGTHENING IRON-BASE ALLOYS BY SHOCK WAVES.
Rept. for 15 Jun 63-15 Jun 64,
by B. G. Koepke, R. P. Jewett, and W. T. Chandler.
Oct 64, 152p Rocketdyne-R-5757
Contract AF33 657 11250, Proj. 7351, Task 735103
ML TDR64 282

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Iron alloys, Hardening), (*Hardening, Iron alloys), (*Shock waves, Hardening), Steel, Pearlite, Martensite, Stainless steel, Dispersion hardening, Hardness, Ferrites, Pressure, Transformations, Electron microscopy, Loading (Mechanics), Microstructure, Crystal lattice defects, Electron diffraction analysis.

A study was conducted to obtain information on the mechanisms of strengthening produced in iron-base alloys by high-pressure shock waves. Three types of alloys were studied: (1) steels normally hardened by cold work, (2) steels normally hardened by heat treatment, and (3) austenitic steels. Principal investigative techniques employed were transmission electron microscopy and hardness measurements. These alloys were subjected to explosive shock loading at 158 and 283 kilobars.

AD-607 799 Div. 17
OTS Prices: HC $2.00/MF $0.50

Battelle Memorial Inst., Columbus, Ohio.
EFFECT OF ELECTRON CONCENTRATION ON THE PROPERTIES OF ALLOYS OF REFRACTORY METALS.
Annual topical rept.,
by J. G. Booth. 30 Oct 64, 39p
Contract Nonr3589 00

Unclassified report

Descriptors: (*Refractory metal alloys, Physical

17. Metallurgy

AD-607 481 Div. 17
OTS Prices: HC $2.00/MF $0.50

Defense Metals Information Center, Columbus, Ohio.
THE EFFECTS OF HEAT-TREATING AND TESTING ENVIRONMENTS ON THE PROPERTIES OF REFRACTORY METALS,
by F. F. Schmidt, D. J. Maykuth, and H. R. Ogden.
20 Aug 64, 35p DMIC-205
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Refractory metals, Mechanical properties), (*Environmental tests, Refractory metals), Heat treatment, Niobium, Tantalum, Molybdenum, Tungsten, Gases, Foils, Contamination, Loading (Mechanics), Stresses, Rupture, Chemical analysis, Oxidation, Columbium alloys, Molybdenum alloys, Controlled atmospheres, Vacuum, Tantalum alloys, Zirconium alloys, Vanadium alloys, Tungsten alloys, Hafnium alloys, Titanium alloys, Carbon alloys.

Studies on the effects of heat-treating and testing environments for the refractory metals have been limited primarily to the unalloyed metals and a few alloys of columbium and molybdenum. Most of this work has relied on compositional changes as a means of assesing the effects of various environments on these materials. It has been shown that all of these materials are subject to contamination or purification in various test environments. The residual gases H2, CO(or N2), and H20, constitute the major sources of contamination when testing columbium and tantalum materials in vacua. Under the same conditions, molybdenum and molybdenum alloys containing carbon and reactive-metal additions are subject to serious decarburization. Nonreactive gaseous atmospheres also cause serious changes in material chemistry, since small quantities of noxious gases are contained in the atmosphere. Several promising methods of circumventing material chemistry changes during various longtime, high-temperature exposures are being used and/or evaluated. (Author)

AD-607 488 Div. 17
OTS Prices: HC $1.00/MF $0.50

Mechanical Properties Data Center, Suttons Bay, Mich.
TITANIUM AND TITANIUM ALLOYS.
Inventory rept.
Oct 64, 16p
MPDCIR 622

Unclassified report

Descriptors: (*Titanium alloys, Mechanical properties), Titanium, Temperature, Experimental data, Tensile properties, Compressive properties, Deformation, Failure (Mechanics), Toughness, Stresses, Aluminum alloys, Vanadium alloys, Manganese alloys, Molybdenum alloys, Lead alloys, Chromium alloys, Silicon alloys, Zirconium alloys, Niobium alloys, Tantalum alloys, Tin alloys, Boron alloys, Iron alloys, Data storage systems, Data.

An inventory is presented which represents a current accounting of all the mechanical properties test data of titanium alloys stored in the data processing system operated by the Mechanical Properties Data Center. These data are available to qualified requesters in response to inquiries regarding the mechanical strength and behavior of titanium alloys. In addition to the measured test results, information on test environment, material condition, material form and test techniques are stored to supplement and define the test data. The inventory has been arranged (grouped) according to temperature of testing and within these groups the counts are further spread on the basis of pre-test conditioning and the presence or absence of a notch in the tested specimen. The Elevated Temperature range includes all tests conducted at 100 F or over; the Low Temperature group includes all tests conducted at less than 30 F; and Room Temperature includes tests conducted at temperatures of 30 thru 99 F, however, the majority of this group was tested at 70 to 90 F. Pre-test Conditioned specimens are those that have been subjected to any condition(s) other than room temperature prior to testing, including pre-loads, abnormal temperature and environment or any combination of these. (Author)

AD-607 564 Div. 17
OTS Prices: HC $6.00/MF $1.25

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ALUMINUM ALLOYS: COLLECTION OF ARTICLES,
ed. by I. N. Fridlyander. 25 Aug 64, 222p
FTD MT64 196; TT 64 71606

Unclassified report

Edited machine trans. of Alyuminievye Splavy (USSR) 1963, v. 2, p. 1-176.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Aluminum alloys, Powder metallurgy), (*Powder metallurgy, Aluminum alloys), Pipes, Sheets, Foils, Powder alloys, Deformation, Mechanical properties, Rolling (Metallurgy), Wire, Mechanical working, Welding, Microstructure, Welds, Powder metals, Reports.

This collection covers questions of the improvement of the technology of obtaining of pressed half-finished products (profiles, pipes, sheets, foil) and stamped details from sintered aluminum powder. There are described the properties of new deformable materials from sintered aluminum alloys (SAS) with low coefficients of linear expansion. Collection is intended for engineering-technical and scientific workers of the metallurgic and machine-building industry, and also for teachers and students of technical colleges. (Author)

AD-607 605 Div. 17, 26
OTS Prices: HC $3.00/MF $0.75

Solar, San Diego, Calif.
EVALUATION OF RMSP TUNGSTEN SHEET.
Quarterly progress rept. no. 5, 1 Jul-30 Sep 64,
by F. St. Germain, M. R. Licciardello, G. Pritchett, D. Jones, and A. Marchese. 15 Oct 64, 66p
Solar-ER 1399-5
Contract NOw63 0786d, Proj. 3478 62

Unclassified report

Rept. includes Appendix A, 'Elevated Temperature Tensile Tests on Single Riveted Joints of 0.06 and 0.100 RMSRP Tungsten Sheet,' summary of Southern Research Institute.

Descriptors: (*Tungsten, Sheets), (*Sheets, Tungsten), Material forming, Drawing (Machine processing), Joining, Brazing, Diffusion bonding, Tensile properties, Microstructure, Joints, Riveted joints, Bonded joints, Mechanical properties, Tantalum, Platinum alloys, Boron alloys, Molybdenum.

Further study was conducted to determine the formability behavior of RMSP tungsten sheet using a variety of shop processes. Additional forming parameters were established for deep drawing and dimpling. The results of the

18. Military Sciences and Operations

AD-607 497 Div. 18
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
REVOLUTION IN MILITARY SCIENCE, ITS IMPORTANCE AND CONSEQUENCES, MILITARY ART ON A NEW STAGE,
by V. Sokolovskii and M. Cherednichenko.
15 Oct 64, 16p
FRD TT64 996; TT 64 71601
Unclassified report

Unedited rough draft trans. from Krasnaya Zvezda (USSR) 1964, no. 203, 28 Aug, p. 2-3.

Descriptors: (*Nuclear warfare, Military tactics), (*Military strategy, Nuclear weapons), Armed forces (Foreign), Theory, Defense systems, Aerial warfare, Tactical warfare, USSR.

The central problem of modern military art is defined as the development of new methods of conducting armed conflict. The changes involving the radical military-technical re-equipping of Soviet Armed Forces, are described.

AD-607 520 Div. 18, 28
OTS Prices: HC $1.00/MF $0.50

Dunlap and Associates, Inc., Darien, Conn.
DEVELOPMENT OF A MAN-COMPUTER SYSTEM FOR SOLVING A TARGETING PROBLEM,
by Ugo O. Gagliardi. 1964, 22p
Contract Nonr3602 00
Unclassified report

Paper presented at the Western States Navy Research and Development Clinic, Montana State College, Bozeman, 22-24 Jul 64.

Descriptors: (*Systems engineering, Warfare), (*Linear programming, Undersea warfare), (*Submarines, Scheduling), Targets, Weapon systems, Optimization, Search theory, Guided missile defense systems, Operations research, Human engineering, Deployment, Automation.

This study was conducted to develop a method for the design of computerized problem-solving aids. The method relies on the observation of problem-solving behavior and utilizes the evidences of heuristic procedures displayed by the subject as indicators of processing overloads. This information is, in turn, used to formulate problem-solving aids whose effectiveness is verified experimentally. The problems used were selected because they have a formal structure which admits many interpretations--from the design of minimal switching circuits to the dispositon of weapon systems. The subject's task was to allocate hypothetical missile-firing submarines so that a specified number of targets was covered by the fewest possible ships. This task could be formulated as a linear integer programming problem which was solvable by Gomory's algorithm. However, complete automation of the task, using this algorithm, was undesirable because the procedure was excessively time-consuming when more than a few solutions were required. Experiments indicated that the subject's processing limitations resulted in a slow and biased search for elements from which to assemble solutions. The aided system delegated the subtask of finding key elements to an automated process and let the person assemble these elements into deployments. The effectiveness of this arrangement was shown by the fact that aided subjects found more solutions and more uniformly distributed solutions than unaided subjects. (Author)

AD-607 536 Div. 18
OTS Prices: HC $3.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE AMERICAN SCIENTIFIC STRATEGISTS,
by Bernard Brodie. Oct 64, 54p P-2979
Unclassified report

Prepared as the introductory chapter to a volume of selected essays on strategy by various American writers, to be collected and edited by Bernard Brodie for publication, in French translation, by Editions Stock, Paris, 1965.

Descriptors: (*Military strategy, United States), (*Reports, Military strategy), History, Military publications, Military personnel, Scientific personnel, Professional personnel, Strategic warfare, Nuclear weapons, Game theory, Decision making, Defense systems.

Several selected essays by various American military writers are discussed. The articles, representing current American strategic thinking by professionals in the field, are being collected and edited for publication in French translation.

AD-607 565 Div. 18, 22, 31
OTS Prices: HC $4.00/MF $0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NAVAL AIR DEFENSE OF SHIPS,
by K. V. Morosow. 20 Oct 64, 223p
FTD TT64 585; TT 64 71605
Unclassified report

Edited trans. of mono. Luftabwehr der Schiffe, Berlin, 1963, 119p.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Naval vessels (Combatant), Antiaircraft defense systems), (*Ships, Antiaircraft defense systems), (*Antiaircraft defense systems, Shipborne), Aerial warfare, Antiaircraft guns, Fire control systems, Antiaircraft ammunition, Rockets, Guided missiles (Surface-to-air), Naval operations, East Germany.

Contents: Deployment of air-combat facilities against naval targets; anti-aircraft artillery (anti-aircraft weapons, ammunitions, fire-control equipment, firing preparation); anti-aircraft rockets; combat experience in utilization of aerial combat facilities; organization of air defense aboard combat vessels under conditions of modern warfare.

AD-607 589 Div. 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOVIET INFLUENCES ON AN ARMS CONTROL ENVIRONMENT,
by Thomas W. Wolfe. Oct 64, 18p P-2995
Unclassified report

This paper was prepared for delivery at the Southern California Arms Control Workshop, El Segundo, 1-2 Oct 64.

properties), (*Transition elements, Alloys), Rhenium alloys, Chromium alloys, Molybdenum alloys, Tungsten alloys, Grain structures (Metallurgy), Stresses, Sensitivity, Magnetism, Internal friction, Magnetic properties, Antiferromagnetism, Resistance (Electrical), Temperature, Crystallography, Impurities, Solubility, Transition temperature, Mechanical properties.

The mechanical and electrical properties of the Group VI-A metals are studied with magnetic-susceptibility and antiferromagnetic methods. These results are described and fitted into the framework of what is known about the electronic structure of the Group VI-A transition metals and their alloys.

AD-607 916 Div. 17, 25
OTS Prices: HC $4.00/MF $0.75

Massachusetts Inst. of Tech., Cambridge.
INVESTIGATION OF PARAMETERS INFLUENCING SOLIDIFICATION BEHAVIOR OF ALUMINUM ALLOYS.
Annual rept.
by H. D. Brody and M. C. Flemings. Jun 63, 120p
Contract DA19 020ORD5706A

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Aluminum alloys, Phase studies), (*Phase studies, Aluminum alloys), (*Casting, Aluminum alloys), Eutectics, Castings, Microstructure, Diffusion, Numerical analysis, Copper alloys, Crystal structure, Solids, Temperature, Magnesium alloys, Zinc alloys, Thermal properties.

The analysis of the solidification curve for the traditional cases of equilibrium and normal non-equilibrium solidification has been extended to include computation for a binary alloy of any phase diagram. An additional case, taking into account diffusion within the solid phase, has been analyzed to give a solidification curve sensitive to the mode of solidification, in particular the size of the solidification element. Expressions have also been derived for each of the three solidification cases in order to compute the rate of solid formation, the interface and average compositions of each phase, the rate of change of the composition with the progress of the solidification, and the relation of the amount of non-equilibrium phase to the size of the solidification element. Numerical analysis was used to calculate the change of the concentration profile on a microscale within a dendrite, due to diffusion within the solid. Apparatus and control equipment were designed and assembled for controlled ingot solidification. In addition to the extended solidification heats described below, the equipment permits (a) interrupted solidification, (b) isothermal solidification, (c) programmed solidification, (d) unidirectional solidification, (e) solidification under vibration, and (f) solidification with stirring. (Author)

known that the weapon itself is not absolutely accurate and that its rounds will fall within some probability distribution. Furthermore it is known that any sensor device, in locating the target will also locate the target to within some probability distribution. It is the purpose of this report to consider the nature of the probability distribution in locating the target through three basic methods for detection, and to consider a proposed closed system employing weapon, detector and target for estimating this cumulative probability distribution. (Author)

AD-607 750 Div. 18, 15
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
NOMOGRAPH FOR THE DETERMINATION OF THE COMMON AREA OF INTERSECTION OF TWO DISTRIBUTED CIRCLES,
by James A. Nickel and James D. Palmer. 4 Mar 64, 11p OURI-TR-1107-5-9
Contract DA34 031AIV679

Unclassified report

Descriptors: (*Nomographs, Production), Range finding, Circular error probability, Target acquisition, Rings, Statistical distributions, Analytic geometry.

When two circles are distributed with a specified probable error about a common center, the question naturally arises as to the area of intersection or overlap. This is not a constant but will follow a probability distribution determined by the distances between centers. It was the purpose of this report to develop a nomograph to determine the expected least upper bound of the area overlap at any prescribed level of assurance. The problem consists of two parts. One of these is to determine the area of intersection of two arbitrary circles as a function of the separation of their centers. The second problem is to find the statistical distribution of the distances between centers. In the third section, this is shown to be the same distribution of a point of impact from its intended center of impact, providing the centers have a common circular gaussian normal distribution.

AD-607 767 Div. 18, 32
OTS Prices: HC $3.00/MF $0.50

Special Operations Research Office, American Univ., Washington, D. C.
COUNTERINSURGENCY BIBLIOGRAPHY SUPPLEMENT NO. 4,
by Margaret Mughisuddin. Sep 64, 56p SORO-RM-64-13

Unclassified report

Operating under contract with the Dept. of the Army, see also AD-433 158.

Descriptors: (*Counterinsurgency, Bibliographies), (*Bibliographies, Counterinsurgency), Guerrilla warfare, Military strategy, Foreign policy, United States government, Warfare, Models (Simulations), History, Abstracting, Military intelligence, Countermeasures.

Contents: The insurgency problem; United States posture; Administrative matters; Intelligence and counterintelligence; Population management; Antiguerrilla warfare; Legality and morality; World War II: Axis counterinsurgency; Post-World War II cases.

AD-607 888 Div. 18, 23, 29
OTS Prices: HC $4.00/MF $0.75

Electric Boat Div., General Dynamics Corp., Groton, Conn.
BEHAVIORAL AND OPERATIONAL ASPECTS OF TACTICAL DECISION MAKING IN AAW AND ASW. Technical rept.,
by Raymond C. Sidorsky, Joan F. Houseman, and David E. Ferguson. Aug 64, 116p
Contract N61339 1329
NAVTRADEVCEN 1329 1

Unclassified report

Descriptors: (*Decision making, Training devices), (*Training devices, Decision making), Behavior, Military psychology, Naval operations, Psychometrics, Training.

This report describes Phase I of a continuing research program intended to provide data related to those aspects of tactical decision-making behavior that can be trained. The study included the delineation of the organization and responsibilities of AAW and ASW personnel as well as the development of ACADIA - a Taxonomy of Tactical Decision Tasks. Several behavioral traits are discussed in regard to their applicability to the derivation of generalized behavioral criteria. Also discussed is a possible technique for rating or scoring decision responses in terms of various 'operational' criteria. An experiment was conducted in which the subject was required to 'implement' a course of action based on his reaction to the relationship between his own and an enemy's probability of success, both of which increased as a function of time. The results disclosed several characteristics of human decision-making behavior relevant to the design and utilization of decision-making trainers. (Author)

Descriptors: (*Arms Control, USSR), (*USSR, Arms control), Disarmament, Nuclear warfare, Nuclear weapons, Deterrence, Attitudes, Communism, Leadership, Economics, Power.

The sharp distinction drawn by the Soviets between the concepts of 'arms control' and 'disarmament' is discussed. In the Soviet lexicon, the term 'arms control' has been given a pejorative flavor. It has been associated with such alleged Western purposes as attempts to 'legalize' nuclear war, to lend respectability to the arms race, and to facilitate espionage against the Soviet camp under the cover of control over armaments. In short, the Soviets generally have sought to picture arms control as a devious Western device to avoid genuine disarmament, which they define as reducing and ultimately doing away with armed forces and all their institutional appurtenances.

AD-607 649 Div. 18, 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ANALYTICAL SUPPORT FOR DEFENSE PLANNING,
by G. H. Fisher. Oct 62, 7p P-2650
Unclassified report

Presented at a long-range planning meeting held at Allison Div., General Motors Corp., 17-18 Oct 62.

Descriptors: (*Defense systems, Systems engineering), (*Systems engineering, Defense systems), Weapon systems, Costs, Armed forces operations, Limited war, Strategic warfare, Aerial warfare, Game theory, Dynamic programming, Monte Carlo method, Decision making, Simulation, Procurement, Symposia.

The subject of 'analytical support for defense planning' is discussed. Since World War II, an important development in defense planning has been the generation and use of new techniques for the systematic examination of alternative proposals for future military systems and forces, which is called 'systems analysis.' The context of this analysis is usually such that the time horizon is not 'the present,' but rather some 5, 10, or even 15 years into the future. This means that the focus is not so much upon operational types of questions; instead it is upon development and procurement decisions.

AD-607 678 Div. 18, 12, 22
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AN APPROXIMATION ALGORITHM FOR AN OPTIMUM AIM POINTS PROBLEM,
by Sidney I. Firstman. 22 Apr 59, 30p P-1678
Unclassified report

Prepared for presentation at the National Meeting of the Operations Research Society of America (15th), Washington, D. C., 14-15 May 64.

Descriptors: (*Impact prediction, Guided missiles), (*Site selection, Guided missile targets), Targets, Vulnerability, Kill probabilities, Military strategy, Operations research, Numerical methods and procedures, Terminal ballistics.

An algorithm to solve the particular problem of assigning weapons over a target complex in an effective manner is considered. The case of where to attach a city-target complex with six missiles of 1/2-MT yield which are delivered according to a circular normal distribution is examined.

AD-607 719 Div. 18, 27, 30
OTS Prices: HC $1.00/MF $0.50

Naval Training Device Center, Port Washington, N.Y.
AUTOMATIC MODEL PROPULSION SYSTEM FOR 3-D TERRAIN.
Technical rept.,
by Thomas McKee. Sep 64, 10p
NAVTRADEVCEN IH21
Unclassified report

Descriptors: (*Military strategy, Display systems), (*Training devices, Models (Simulations)), (*Propulsion systems, Models (Simulations)), Amphibious operations, Terrain models, Vehicles, Remote control systems.

The report introduces a novel approach to group training in tactics, and war game exercise. It describes a dynamic display produced by automatic propulsion of scale model vehicles on 3-dimensional terrain with capabilities for closed-loop operation of an automatic, programed system for maneuver control of up to 120 vehicles. (Author)

AD-607 747 Div. 18
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
BATTLEFIELD SIMULATION FOR FIRST ROUND ACCURACY REQUIREMENTS OF SIMULTANEOUS MULTIPLE FIRINGS.
Technical rept.,
by James A. Nickel and J. D. Palmer. 1 Dec 62, 15p
Contract DA34 031AIV679
Unclassified report

Descriptors: (*Tactical warfare, Simulation), (*Mathematical models, Tactical warfare), Effectiveness, Probability, Stochastic processes, Damage, Target acquisition.

The tactical situation of determining the minimum accuracy requirements of simultaneous multiple firings on a single target has been interpreted to be damage assessment or area coverage effected on a circular target. All rounds were assumed to have the same aim point with the centers of impact of each pattern distributed independently of all other patterns. The complexity of a precise mathematical analysis dictated use of a stochastic model. This required the design and development of an electronic Battlefield Simulator. The output from the simulator has been reduced to a family of curves from which the probabilities of target coverage could be determined for a given set of parameters. (Author)

AD-607 748 Div. 18, 6
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
A CLOSED SYSTEM MODEL FOR TARGET ACQUISITION,
by James A. Nickel and James D. Palmer.
19 Jun 64, 22p OURI-TR-1107-3-4
Contract DA34 031AIV679
Unclassified report

Descriptors: (*Target acquisition, Models (Simulations)), (*Models (Simulations), Target acquisition), Probability, Targets, Detection, Target position indicators, Weapons, Range finding.

The fundamental problem of target acquisition is to locate the desired target providing the necessary parameters or coordinates to enable the weapon to fire upon the target with a maximum probability of a hit. It is well

20. Nuclear Physics and Nuclear Chemistry

AD-607 494 Div. 20, 17
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
NEW INFORMATION ON NEUTRON EMBRITTLEMENT AND EMBRITTLEMENT RELIEF OF REACTOR PRESSURE VESSEL STEELS,
Summary rept.,
by L. E. Steele and J. R. Hawthorne. 6 Oct 64, 42p
Contract AT49 5 2110, Projs. RR007 01 46 5409, SR007 01 01, Task 0858
NRL 6160

Unclassified report

Presented at the ASTM Symposium held in Chicago, Ill., 22-24 June 64.

Descriptors: (*Reactor materials, Steel), (*Steel, Radiation damage), (*Radiation damage, Steel), (*Brittleness, Steel), Neutrons, Heat treatment, Pressure vessels, Reactor materials, Ductility, Transition temperature, Temperature, Carbon alloys, Experimental data.

Neutron embrittlement of the carbon and low-alloy steels investigated has been defined in terms of increases in the nil ductility transition (NDT) temperature. Increases in the NDT of pressure vessel steels as great as 545F have been observed. The extent of embrittlement has been shown to depend upon the neutron exposure, the type of steel, and the irradiation temperature. Embrittlement relief through annealing heat treatment at temperatures above the pressure vessel operating temperature has been demonstrated. Significant embrittlement relief was observed even with multiple irradiation-annealing cycles, the extent of relief being primarily dependent upon the irradiation temperature and the subsequent annealing temperature. Experimental data are reviewed with consideration for application to operating nuclear pressure vessel conditions. Preliminary results of power reactor surveillance and of the evaluation of one pressure vessel after nuclear service are related to experimental results. The value of extending the evaluation of surveillance speciments and of pressure vessels after removal from nuclear service are reviewed with reference to current uncertainties as to possible nuclear environmental and stress effects. (Author)

AD-607 568 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RED STAR SERIES ON ATOMIC ENERGY. PART IX. THE PHYSICS OF THE BEHAVIOR OF NUCLEAR FORCES-PENETRATING RADIATION,
by A. Sedov. 1954, 12p T-35 pt. 9
TT 64 71619

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1954, 13 May, p. 3.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-607 582.

Descriptors: (*Nuclear particles, Penetration), (*Penetration, Nuclear particles), U.S.S.R., Nuclear explosions, Fission, Gamma-rays, Neutrons, Nuclear forces, Photons, Materials, Neutron capture, Neutron reactions, Artificial radioactivity, Radiation hazards, Radiation damage, Nuclear properties.

AD-607 581 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE POSSIBLE SPREAD OF RADIOACTIVE INFECTION BY THE FISSION PRODUCTS OF U235,
by Hans Thirring. 23 Sep 49, 24p T-17
TT 64 71612

Unclassified report

Trans. of Acta Physica Austriaca, 1949, v. 2, p. 379-400.

Descriptors: (*Radiological contamination, Fission products), (*Fission products, Mass destruction weapons), Uranium, Radioactive isotopes, Nuclear power plants, Half life, Radioactive decay, Radiation damage, Gamma rays, Fission product poisoning, Radiation tolerance, Radiological dosage, Lethal dosage, Sand, Dust, Equations.

A highly industrialized country, such as the United States, after conversion of one-fifth of her electricity production facilities into nuclear power plants, is in a position, even with a complete lack of atomic bombs, to make areas uninhabitable which are greater than the sum of the areas of all towns and cities of a large country. The particular military value of this criminal weapon of radioactive contamination by the fission products of U235 can be found in the fact that the enemy's residences and industrial installations are undamaged, while the population are either killed or driven away.

AD-607 582 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RED STAR SERIES ON ATOMIC ENERGY. PART X. THE PHYSICS OF THE BEHAVIOR OF NUCLEAR FORCES-RADIOACTIVE SUBSTANCES,
by A. Sedov. 1954, 10p T-35 pt. 10
TT 64 71613

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1954, 20 May, p. 3.

Descriptors: (*Nuclear energy, Nuclear forces), (*Nuclear forces, Radioactivity), (*Radioactivity, Nuclear energy), Radioactive isotopes, Fission, Nuclear particles, Uranium, Nuclear explosions, USSR.

AD-607 597 Div. 20
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
RED STAR SERIES ON ATOMIC ENERGY. PART VIII. THE PHYSICS OF THE BEHAVIOR OF NUCLEAR FORCES: LIGHT RADIATION,
by M. Arkhipov. 1954, 10p T-35 pt. 8
TT 64 71623

Unclassified report

Trans. from Krasnaya Zvezda (USSR) 1954, 8 May, p. 3.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
(See also AD-607 582).

Descriptors: (*Light, Nuclear explosions), (*Nuclear explosions, Light), Temperatures, Surface temperatures, Light pulse, Ultraviolet radiation, Infrared radiation, Burns, Recombination reactions, Radiation damage, Radiation hazards.

This report consists of a popularized article on light

19. Navigation

AD-607 577 Div. 19, 30
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
CALIBRATION OF DIVIDED CIRCLES,
by M. F. Popelka, Jr. and M. Smith. 27 May 60,
37p STL/TN-60-0000-00108
Unclassified report

Descriptors: (*Calibration, Theodolites), (*Inertial guidance, Instrumentation), Optical instruments, Collimators, Errors, Rings.

Calibration of angular devices, such as rotary tables, optical dividing heads, and gyro turntables, requires the utmost care and precision. Since these devices often serve as fundamental measurement standards in testing and evaluating precision gyros and accelerometers, their calibration is of basic importance. A study was therefore undertaken to investigate the techniques and limitations associated with precision angular measurements. The results of and the procedures used in the calibration of a Leitz optical dividing head and a Fecker multimode turntable are described in this report to acquaint the reader with the calibration techniques presently used in the Space Technology Laboratories, Inc., Inertial Equipment Laboratory and to discuss their advantages and accuracy limitations. Brief descriptions of the equipment which was calibrated and the operating principles of the standards employed are included. (Author)

AD-607 853 Div. 19
OTS Prices: HC $4.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INERTIAL NAVIGATIONAL SYSTEMS,
by V. S. Frolov. 14 Sep 64, 128p
FTD MT64 57; TT 64 71637
Unclassified report

Edited machine trans. of mono. Inertial'nye Sistemy Navigatsii, Moscow, 1963, 126p.

Descriptors: (*Inertial navigation, Reviews), Accelerometers, Gyro stabilizers, Tracking, Servomechanisms, Navigation computers, Aircraft, Submarines, Underwater navigation, Errors, Doppler navigation, Radio navigation, Radar navigation, Celestial navigation, Scanning, Spacecraft, Space navigation, Weightlessness, USSR.

A semi-technical discussion is given of operating conditions, interaction of separate units and causes of errors of inertial guidance and navigational systems. Considerable attention is given to analysis of the operation of inertial systems under conditions of space flight and their use in the single navigational complex of an aircraft. (Author)

AD-607 899 Div. 19, 2, 12
OTS Prices: HC $3.00/MF $0.75

Ewen Knight Corp., Needham, Mass.
MOLECULAR ATMOSPHERIC OXYGEN HORIZON STUDY, DESIGN OF A PROTOTYPE RADIOMETER.
Scientific rept. no. 2,
by A. E. Lilley and F. R. Zatlin. 22 Jun 64, 70p
Contract AF19 628 3239, Proj. 4427, Task 442702
AFCRL 64 527
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.
See also AD-600 783.

Descriptors: (*Radiometers, Design), (*Space navigation, Radiometers), Atmosphere models, Oxygen, Molecules, Satellites (Artificial), Horizon scanners, Configuration, Telemeter systems.

The report constitutes a two-fold summary of theoretical analysis and systems design for the purpose of utilizing the 60 Gc radiation characteristics of atmospheric oxygen for horizon definition purposes and related measurements. The results of the theoretical analysis are specific and depend directly upon the Van Vleck-Weisskopf theory and the assumed ARDC model atmosphere. The departure of the predicted horizon effects from the actual properties of the horizon will depend primarily upon the validity of the ARDC mode atmosphere. The results of the radiometric system design may be divided into two categories: first, those subsystems that are independent of the carrier vehicle, and second, those subsystems which interface with the carrier vehicle. The system designs are supported by laboratory test data. The theoretical predictions, combined with designed radiometers and vehicular capabilities, lead to two possible modes of operation. Either of these systems would yield quantitative data capable of evaluating the 60 Gc atmospheric oxygen horizon for space sextant purposes. (Author)

AD-607 971 Div. 19
OTS Prices: HC $1.00/MF $0.50

Wolf Research and Development Corp., West Concord, Mass.
ERROR ANALYSIS 3-D AZIMUTH (OPTICAL).
Scientific rept.,
by Richard M. Moroney. Aug 63, 21p
Contract AF19 628 2379, Proj. 7600, Task 760003
Unclassified report

Descriptors: (*Azimuth, Optical tracking), Direction finding, Position finding, Errors, Analysis, Vector analysis, Least squares method, Matrix algebra, Equations.

Contents:
Errors in least squares solution of linear equation
Application to the long line Azimuth problem
Errors in the long line Azimuth
Estimation of data variance in least squares.

intensities within a range of ±50 per cent. The feasibility and practicability of aerial survey as a radiological monitoring tool was established. The CD V-710 was established as a practical interim aerial-survey instrument. The development of an instrument having greater suitability for aerial monitoring than present civil defense instruments is encouraged. It is recommended that further aerial-survey operational studies be conducted at any future continental test series. (Author)

AD-607 647 Div. 20
OTS Prices: HC $0.50/MF $0.50

Federal Civil Defense Administration, Battle Creek, Mich.
EFFECT OF FALLOUT CONTAMINATION ON RAW AGRICULTURAL PRODUCTS,
by Harold V. Leininger, Edwin P. Laug, Raymond D. Chapman, Homer J. McConnell, and Alan T. Spiher.
Mar 58, 19p
Proj. 38 2
WT 1497

Unclassified report

Rept. on Operation Plumbbob, Nevada Test Site, May-Oct 57. Prepared in cooperation with Food and Drug Administration, Washington, D. C.

Descriptors: (*Nuclear explosions, Underground explosions), (*Irradiated food, Radioactive fallout), (*Radioactive fallout, Irradiated food), Radiobiology, Radiation effects, Cereals, Fruits, Vegetables, Decontamination.

Wheat, dried fruits, snapped corn (unhusked), soya beans, cotton seed, and potatoes were exposed to moderate contamination resulting from fallout under actual field conditions. It was found that water washing as applied to dried fruits, soya beans, and cotton seed was relatively ineffective in removing fallout contamination; scrubbing potatoes, followed by removal of the skins, was effective. The protecting layers of husk around ears of corn prevented the contamination of the grain inside. A complete milling operation on fallout-exposed wheat showed that a considerable amount of contamination could be removed by cleaning operations as well as by separation of the bran. Flour resulting from such contaminated wheat exhibited relatively low residual radioactivity. Because of the low degree of contamination of the wheat, caution should be used in extrapolating these results to more severe situations. (Author)

AD-607 668 Div. 20, 30
OTS Prices: HC $10.90/MF $3.25

Nuclear Defense Lab., Edgewood Arsenal, Md.
A LISTING OF CINDA, AN INDEX TO THE LITERATURE ON MICROSCOPIC NEUTRON DATA,
by Herbert Goldstein and Malvin H. Kalos.
1 Jul 64, 790p
Task A2 11 039
DASA 1535; NDL SP10

Unclassified report

Prepared in cooperation with Columbia Univ., New York, Courant Inst. of Mathematical Sciences, New York Univ., N. Y., and United Nuclear Corp., White Plains, N. Y.
Part of the work was supported by Contract AT 30 1 GEN72.

Descriptors: (*Neutron cross sections, Indexes), (*Data processing systems, Neutron cross sections), Neutrons, Computers, Bibliographies, Data, Isotopes, Chemical elements, Nuclear cross sections.

CINDA (Computer Index Neutron DAta) is a bibliographical index of information concerning microscopic neutron cross sections and allied data for specific elements and isotopes. It covers the literature, both published and unpublished, since the beginning of 1956. While the references covered mostly report on measurements, CINDA also includes theoretical calculations, cross section evaluations and compilation insofar as they refer to specific target nuclei.

AD-607 921 Div. 20
OTS Prices: HC $6.00/MF $1.25

Holmes and Narver, Inc., Las Vegas, Nev.
PRESHOT AND POSTSHOT STRUCTURE SURVEY.
Final rept.
Dec 63, 208p
Contract AT29 2 20
ARPA VUF1015

Unclassified report

Rept. on Vela Uniform, Proj. Shoal, Fallon, Nev., 26 Oct 63.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Nuclear explosion damage, Structures), Nuclear explosions, Photographs, Safety, Underground explosions, Nevada.

This survey was conducted in accordance with the requirements of the Operational Safety Plan, Project Shoal, dated May 1963. The report documents the preshot and postshot condition of all structures within 10 miles of Ground Zero (GZ), plus structures at Salt Wells and surface structures at mines that were included in the mine survey. The structures were surveyed in order to document, photographically and in writing, any physical changes resulting from the Shoal Event. A detailed report covering each structure is contained in Appendix A. These reports include a statement of the preshot condition and comment on any physical changes observed. These included a report on 27 properties. Appendix B contains 321 preshot and postshot photographs, and Appendix C consists of a Project Shoal Vicinity Map.

AD-607 980 Div. 20, 2
OTS Prices: HC $4.00/MF $0.75

Isotopes, Inc., Westwood, N. J.
PROJECT SPRINGFIELD REPORT.
Progress rept.,
by Edwin F. Danielsen. 15 Jul 64, 113p
Contract DA49 146XZ079
DASA 1517

Unclassified report

The initial distribution copies contain color which will be shown in black-and-white when it is necessary to reprint.

Descriptors: (*Atmosphere, Radioactive fallout), (*Radioactive fallout, Atmospheric sounding), Stratosphere, Tropopause, Troposphere, Transport properties, Nuclear particles, Air mass analysis, Atmospheric sounding, Flight paths, Research planes, Radiosondes, Meteorological charts, Meteorology,

This report is concerned with the theory and confirmation of a stratospheric-tropospheric exchange which accompanies a folding of the tropopause. Air from the lower part of the cyclonic stratosphere is extruded to form a thin inclined layer in the troposphere. The SPRINGFIELD data prove that the extruded tropospheric

radiation produced by nuclear explosions. The causes, properties, effects and associated phenomenon are discussed without technical details.

AD-607 639 Div. 20, 13, 22
OTS Prices: HC $1.25/MF $0.75

Coast and Geodetic Survey, Washington, D. C.
SURFACE MOTIONS FROM AN UNDERGROUND EXPLOSION,
by D. S. Carder, W. K. Cloud, L. M. Murphy, and J. H. Hershberger. Jun 58, 60p
Proj. 26 4d
WT 1530

Unclassified report

Rept. on Operation Plumbbob, Nevada Test Site, May-Oct 57.

Descriptors: (*Nuclear explosions, Underground explosions), (*Underground explosions, Shock waves), (*Shock waves, Surfaces), (*Surfaces, Motion), Seismographs, Seismological stations, Propagation, Acceleration, Attenuation, Mathematical analysis, Explosion effects, Surface properties.

Seismic effects of Rainier, a 1.7-kt nuclear shot detonated 900 feet underground, were measured in terms of ground surface motion at ten strong-motion seismograph stations located 1200 to 45,000 feet from the source. In addition, records were borrowed from seven teleseismic stations located 100 to 300 miles from the source. Recorded accelerations attenuated from a maximum single-component value of 2.6 g at 1280 feet to 0.009 g at 17,640 feet. Gutenberg-Richter magnitude of Rainier, calculated as for a natural earthquake from seven Wood-Anderson seismograph records, was 4.6. Earthquakes of 4.6 magnitude are felt up to 60 miles from the epicenter, however, Rainier was felt by only a few observers at 2-1/2 miles. Seismologists at established teleseismic stations were able to pick out Rainier's elastic wave signature on seismograms at considerable distance. Very small amplitude waves from Rainier were found on the Coast and Geodetic Survey, College, Alaska, seismogram, 3600 km away, although attempts in the eastern United States at distances of 2000 to 3000 km, using conventional instruments, were not successful.

AD-607 642 Div. 20, 13, 22
OTS Prices: HC $2.25/MF $0.75

Stanford Research Inst., Menlo Park, Calif.
SURFACE MOTION FROM AN UNDERGROUND DETONATION,
by L. M. Swift and D. C. Sachs. 1 Apr 59, 93p
Proj. 26 4a
WT 1528

Unclassified report

Rept. on Operation Plumbbob, Nevada Test Site, May-Oct 57.

Descriptors: (*Nuclear explosions, Underground explosions), (*Underground explosions, Shock waves), (*Shock waves, Surfaces), (*Surfaces, Motion), Explosion effects, Propagation, Nuclear explosion damage, Acceleration, Strain (Mechanics).

Surface and near-surface acceleration and strain were measured on a deep underground nuclear burst (Rainier Shot; 900 feet; 1.7 kt) to permit extrapolation of results to nuclear detonations of other yields under different test or employment conditions. Results indicate that a large earth cap, probably including more than one chunk, separated from the mesa over the charge and subsequently fell back into place. The only significant vertical displacement occurred at or near ground zero and reached a maximum of approximately 0.9 feet. Both acceleration and horizontal surface strain measurements suggest that the principal disturbance on the mesa surface was confined to a small region around ground zero; however, the measurements on the slope indicate significant earth motion. Velocity data (integrated accelerations) indicate that the layering characteristics of the medium exert a great influence upon the severity of the ground motion. The displacement-time (double-integrated accelerations) data at surface zero agrees well with photographic data. In general, the peak displacements indicate that the cap rock moved up and away from surface zero, whereas the permanent displacements on the mesa show that the final positions of the stations are downward and inward toward surface zero, relative to preshot position. (Author)

AD-607 645 Div. 20, 13, 22
OTS Prices: HC $3.00/MF $1.25

IIT Research Inst., Chicago, Ill.
CLOSE-IN TIME-OF-ARRIVAL MEASUREMENTS FOR YIELD OF UNDERGROUND RAINIER SHOT,
by D. C. Anderson and F. B. Porzel. Jul 59, 232p
Proj. 25 1
WT 1495

Unclassified report

Rept. on Operation Plumbbob.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Nuclear explosions, Underground explosions), (*Shock waves, Nuclear explosions), Measurement, Thermal radiation, Explosion effects, Data, Doppler systems, Test methods, Pressure switches, Recording systems, Velocity.

The main objectives were as follows: (1) To furnish a best estimate of the total energy release from the detonation (2) To determine the energy partition which occurs at the various interfaces (3) To determine the hydrodynamic variables which contribute to an understanding of the phenomenology of the underground explosion. The raw data obtained are presented.

AD-607 646 Div. 20
OTS Prices: HC $0.50/MF $0.50

Federal Civil Defense Administration, Battle Creek, Mich.
AERIAL-MONITORING OPERATIONS DEVELOPMENT,
by Fred R. Rehm. Mar 61, 28p
Proj. 36 4
WT 1485; N62 13464

Unclassified report

Rept. on Operation Plumbbob, Nevada Test Site, May-Oct 57.

Descriptors: (*Radiation monitors, Airborne), (*Nuclear explosions, Underground explosions), Health physics instrumentation, Feasibility studies, Acceptability, Experimental data, Civil defense systems.

Operations were conducted to obtain information by aerial, automotive, and ground monitoring radiological surveys for the purpose of evaluating and correlating the data and methods. The results of the aerial surveys have been evaluated, and correlation factors have been developed for the CD V-710 meter which permit the interpolation of aerial readings as groundlevel radiation

22. Ordnance

AD-607 749 Div. 22, 18
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
DETERMINATION OF THE MAXIMUM ALLOWABLE WEAPONS SYSTEM ERROR,
by J. A. Nickel and J. D. Palmer. Feb 62, 25p
OURI-TR-1107-5-4
Contract DA34 031AIV679

Unclassified repor

Descriptors: (*Weapon systems, Errors), (*Circular error probable, Weapon systems), Targets, Probability, Mathematical analysis, Statistical processes, Nomographs, Determination.

The determination of the maximum allowable weapons system error for a single effects pattern on a circular target was rigorously developed from a model using mathematical and statistical methods. Nomograms for the solution were developed and some examples cited illustrating the theoretical limitations. The functional relationships were derived from geometrical considerations specifying the maximum separation of target and effects pattern centers giving a specified area coverage, and a probability model reducing this distance due to the probability distribution of the effects pattern center. (Author)

AD-607 751 Div. 22, 18
OTS Prices: HC $1.00/MF $0.50

Oklahoma Univ. Research Inst., Norman.
METHODOLOGY UTILIZED IN THE DETERMINATION OF WEAPONS SYSTEM ACCURACY REQUIREMENTS,
by James A. Nickel and J. D. Palmer. 16 Dec 63,
14p OURI-TR-1107-5-8
Contract DA34 031AIV679

Unclassified report

Descriptors: (*Weapon systems, Effectiveness), Mathematical models, Targets, Errors, Analog systems,, Statistical functions, Probability, Costs.

The determination of Weapons System Accuracy Requirements is dependent upon the function of the system and accuracy bounds of the component parts of the total system. Briefly discussed are accuracy models for three of the system components. Of these, two idealized models for Target Location are considered. Futhermore, an analogue device is proposed for studying the effects of Weapons Orientation and Delivery Errors. Problems of amalgamation of errors compatible with restraints on the system and suggestion for handling them conclude the paper. (Author)

AD-607 925 Div. 22, 9
OTS Prices: HC $0.50/MF $0.50

Joint Publications Research Service, Washington, D. C.
SHOCK WAVES,
by K. P. Stanyukovich and G. S. Golitsyn.
21 May 64, 16p JPRS(NY)-1595
TT 59 13529

Unclassified report

Trans. of Priroda (USSR) 1958, v. 47, no. 13, p. 33-38. Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Shock waves, Reviews), USSR, Theory, Propagation, Gases.

A general discussion of shock waves: how they are formed, where they are encountered, and the nature of their action.

AD-607 939 Div. 22, 25, 30
OTS Prices: HC $1.00/MF $0.50

Stanford Research Inst., Menlo Park, Calif.
PRESSURE TRANSDUCER FOR MEASURING SHOCK WAVE PROFILES ADDITIONAL GAGE DEVELOPMENT.
Progress rept. nos. 38 and 7, 1-31 Oct 64,
by R. F. Williams. 4 Nov 64, 4p
Contracts DA49 146XZ096, DA49 146XZ280,
Projs. GSU3713, GSU4832

Unclassified report

Descriptors: (*Transducers, Production), Shock waves, Measurement, Pressure, Meters, Piezoelectric crystals, Glass, Epoxy plastics, Vibration isolators.

A method was developed for the fabrication of transducers which incorporate a vacuum deposited layer as the piezoresistive element. The layer is deposited on a polished insulator surface to a thickness of the order of 0.0001 inch. A parallel faced slab of insulator is bonded to the polished surface after deposition of the piezoresistive element.

AD-607 943 Div. 22, 6, 8
OTS Prices: HC $2.00/MF $0.50

National Marine Consultants Div., Interstate Electronics Corp., Anaheim, Calif.
PROBE MEASUREMENTS OF UNDERWATER EXPLOSION BUBBLES.
Final rept.,
by Donald R. Bellows and Alan R. Greenfield.
Oct 64, 46p
Contract Nonr3678 00

Unclassified report

Descriptors: (*Probes (Electromagnetic), Underwater explosions), (*Underwater explosions, Probes (Electromagnetic)), TNT, Shock waves, Instrumentation, Calibration, Bubbles, Oscillation, Electrical conductance, Voltage, Equations, Environmental tests, Measurement.

A previous report 1 discussed various methods of measuring the size and rate of growth of the bubble produced by large underwater explosions. It was concluded in the report that the only feasible direct measuring system is the probe. The construction and testing of a prototype probe is described in this report. Measurements of the bubble produced by a 4-3/4 pound charge of TNT verify that the probe method is indeed feasible and also quite accurate. (Author)

layers contain radioactivity concentrations typical of the stratosphere. Concentrations exceeding the tropospheric by one or two orders of magnitude were measured aboard WB-50 and RB-57 aircraft on specially vectored flight paths. The sharp change in concentrations at the boundaries also confirms that the folding process is predominantly laminar, so it is appropriate to refer to the exchange as a transport rather than a diffusion process. The agreement between the radioactivity and meteorological measurements is remarkable. Of particular value to the radiochemist and meteorologist is the high correlation between the concentrations of radioactivity and the potential vorticity. Since the latter can be determined from conventional radiosonde data, the three dimensional distribution of the former can be approximated. Physical processes capable of mixing the radioactivity from the layers to the ground are also discussed, including their probable distribution with respect to the extruded layers. (Author)

AD-607 982 Div. 20, 2
OTS Prices: HC $2.00/MF $0.50

Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
GEOPHYSICAL EFFECTS OF HIGH-ALTITUDE NUCLEAR EXPLOSIONS OF 1962, AN ANNOTATED BIBLIOGRAPHY,
by Edmund J. Blau. 1 Oct 64, 40p TG-230-B5
Contract NOw62 0604c

Unclassified report

Descriptors: (*Bibliographies, Nuclear explosions), (*Nuclear explosions, Bibliographies), (*Geophysics, Nuclear explosions), Explosion effects, High altitude.

The present compilation is concerned only with geophysical effects produced by the high-altitude tests made in 1962, both American and Soviet . This series is of particular interest because of the creation as a result of the 'Starfish test of 9 July of an artificial radiation belt similar to the natural Van Allen belts. The extent and duration of this belt and the magnitude of other effects of the explosion greatly exceeded the results produced by earlier high-altitude nuclear tests and provided a stimulus for intensive investigation all over the world. In this bibliography, articles of a purely theoretical nature have been omitted, as have those concerned only with radioactive fallout. The total of about 170 references indicates the great interest in the subject. The largest number of articles are concerned with the Starfish explosion, since this was the earliest of the series and produced the most spectacular results.

21. Nuclear Propulsion

AD-607 555 Div. 21, 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
AN EXAMPLE OF ONE-DIMENSIONAL GAS FLOW WITH FRICTION AND HEAT ADDITION,
by M. L. Rosenzweig. 10 Sep 59, 21p
STL/TR-59-0000-00674

Unclassified report

Descriptors: (*Nuclear propulsion, One-dimensional flow), (*One-dimensional flow, Heat transfer), (*Heat transfer, Nuclear flow), Gas flow, Friction, Pressure, Stagnation point, Pipes, Equations.

A simplified method is presented for the estimation of heat transfer and pressure loss in problems involving the flow of a compressible fluid through a constant area pipe in the presence of friction and heat addition. No analysis is given; only significant formulas are presented. An example concerning the heat transfer and pressure drop through a nuclear rocket reactor is used to illustrate the practical design application of the formulas. The calculation leads to design curves indicating the effects of varying inlet Mach number on pressure loss, exit Mach number and total area required to pass a given mass flow. (Author)

AD-607 769 Div. 21, 9
OTS Prices: HC $3.00/MF $0.75

AiResearch Mfg. Co., Los Angeles, Calif.
FLOW STABILITY IN MULTITUBE FORCED-CONVECTION VAPORIZERS,
by P. J. Berenson. Oct 64, 88p AiResearch-L-9448
Contracts AF33 615 1551, AF33 657 8954
APL TDR64 117

Unclassified report

Supported in part by Atomic Energy Commission.
This rept includes Appendix, 'A Photographic Study of the Mechanism of Forced Convection Vaporization,' by P. J. Berenson and R. A. Stone.

Descriptors: (*Liquid metals, Vaporization), (*Nuclear propulsion, Heat transfer), Nuclear reactors, Boilers, Coolants, Fluid flow, Stabilization, Flow visualization, High-speed photography, Pipes, Vapors, Drops.

The report describes work undertaken to resolve the SNAP-50/SPUR liquid-metal boiler two-phase flow stability problems. A review is presented of existing literature pertaining to forced-convection vaporization heat transfer and two-phase flow stability. Dimensionless simulation criteria are defined on the basis of the significant parameters determined from the survey. The test program, in which Freon 113 was used as the test fluid and the values of the dimensionless two-phase flow stability parameters applicable to the SNAP-50/SPUR boiler were simulated, is presented. The design of the transparent closed test loop, which incorporates a five-tube boiler, is described. Conclusions and discussions are presented based on the measured data and the high speed photographs of two-phase flow in both plain tubes and tubes with twisted tape inserts, which indicate that stable flow can be achieved in the SNAP-50/SPUR boiler by inserting at the entrance of each boiler tube an orifice which has a pressure drop between 100 and 200 percent of the two-phase pressure drop.

generator were developed; and volume of the control equipment was reduced from 144 to 32 cubic feet. Performance of the 7WP4 tube exceeded the prediction: limiting horizontal resolution is 650 to 700 lines with a well defined vertical raster. (Author)

AD-607 781 Div. 23, 28
OTS Prices: HC $2.00/MF $0.50

Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
TEST AND EVALUATION OF QUALITATIVE AND QUANTITATIVE PERSONNEL REQUIREMENTS INFORMATION.
Final rept. for Jan-May 62,
by Evan D. Stackfleth. Sep 64, 32p
Proj. 1710, Task 171006
AMRL TDR64 65

Unclassified report

Descriptors: (*Air force personnel, Performance tests), (*Weapon systems, Human engineering), (*Human engineering, Weapon systems), Military requirements, Selection, Learning, Performance (Human), Manpower studies, Maintenance, Simulation.

Some of the problems in the validation of personnel requirements developed and predicted in the Qualitative and Quantitative Personnel Requirements Information reports are described. Included are problems inherent in the validation procedures, such as the nature of the predictor (QQPRI), the problem of criterion selection and bias, and the changing nature of the criterion. Because of the multiple nature of these problems, available testing techniques are not adequate to handle the testing and provide desired information. A solution is presented. This solution requires a procedural change whereby validations are conducted during different but specific stages of system development and test. The validations would be oriented to obtaining the best validation at a particular time and for a particular purpose rather than attempting an overall test. Methods are suggested for determining manning deficiencies and readjusting the personnel subsystem. (Author)

AD-607 782 Div. 23, 28, 30
OTS Prices: HC $4.00/MF $0.75

American Inst. for Research, Pittsburgh, Pa.
THE INVESTIGATION OF STEP SIZE AND ERROR RATE IN PROGRAMMED INSTRUCTION,
by David J. Klaus. Jul 64, 110p
Contract N61339 1208
NAVTRADEVCEN 1208 1

Unclassified report

Descriptors: (*Teaching machines, Military training), Linear programming, Learning, Errors, Students, Training, Tables, Training devices.

An investigation was undertaken to determine whether step size in linear programs could be defined, measured and manipulated, and to determine the effects of various sizes of step on error rate and achievement for learners at three levels of ability. Response, cue, context, and enrichment components of a frame were used to define both intraframe and interframe step size. Numerical scales then were developed to measure step size and a set of manipulations was devised for use in modifying the step size of existing programs. Normative step-size values were determined from a survey of ten published programs. The results of the study suggest that, within the range of step sizes investigated and within the range of error rates produced, neither is an important variable with respect to achievement regardless of the ability level of the learner. It is recommended that less consideration be given to step size when writing a linear program and that less emphasis be placed on error rate when revising a program providing step size and error rate are not excessively large. (Author)

AD-607 787 Div. 23, 30
OTS Prices: HC$1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE TEACHING OF COMPUTING,
by Fred Gruenberger. Oct 64, 6p P-2998

Unclassified report

Descriptors: (*Education, Computers), (*Computers, Education), Instructors, Students, Computer personnel.

The different reasons why teaching the fundamentals of computers are more enjoyable and different from teaching other subjects are offered.

AD-607 809 Div. 23, 30
OTS Prices: HC $1.00/MF $0.50

Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
PROGRAMMED INSTRUCTION - PAST, PRESENT, FUTURE.
Final rept.,
by John S. Abma. Sep 64, 22p
Proj. 1710, Task 171007
AMRL TR64 89

Unclassified report

Paper prepared for publication in 'Research and Technology Division Briefs,' third quarter, 1964.

Descriptors: (*Teaching machines, Education), (*Education, Teaching machines), Training, Learning, Automation, Linear programming, Programming (Computers).

Programed instruction has existed in its present forms for approximately ten years. Three major approaches are: the 'Adjunct Autoinstruction' of Sidney L. Pressey, the 'Intrinsic Programing' of Norman A. Crowder, and the 'Linear Programing' of B. F. Skinner. Most current research is centering on linear programing. Results indicate that programed instruction is successful in some applications, but not the answer to all training problems. The future may see an integration of programed instruction and other training techniques within a systems approach to training and education. (Author)

AD-607 893 Div. 23
OTS Prices: HC $3.00/MF $0.75

Auerbach Corp., Philadelphia, Pa.
A STUDY OF MANPOWER REQUIREMENTS FOR TECHNICAL INFORMATION SUPPORT PERSONNEL.
Final rept.
10 Jan 64, 86p Auerbach-1150-TR-1

Unclassified report

Rept. prepared for the Department of Labor.

Descriptors: (*Management planning, Professional personnel), (*Personnel management, Manpower studies), (*Documentation, Professional personnel), Management engineering, Engineering personnel, Communication equipment, Training, Reports, Libraries, Automation, Standards, Probability.

23. Personnel and Training

AD-607 545 Div. 23, 28
OTS Prices: HC $1.00/MF $0.50

Human Resources Research Office, George Washington Univ., Washington, D. C.
THE EFFECT ON TRAINING AND EVALUATION OF REVIEW FOR PROFICIENCY TESTING.
Research memo.,
by Richard P. Kern and Paul D. Hood. Aug 64, 24p
Contract DA44 188AR02, Task NC0 II
Unclassified report

Descriptors: (*Army personnel, Training), (*Training, Leadership), (*Leadership, Test methods), Military training, Retention, Apptitude tests, Motivation, Performance (Human), Analysis of variance.

The research was concerned with the development of a leadersihip training program for potential Army noncommissioned officers. The major objective was to conduct a series of small-scale preliminary studies which would provide information and experience that would enable staff members to (1) define appropriate training program characteristics and (2) develop tools, techniques, and skills necessary for conducting subsequent field studies in connection with proposed training programs for leader preparation. In order to develop information that would be relevant in devising criteria for evaluating a leadership program, one study dealt with some aspects of the Graded Proficiency Test given at the end of Advanced Individual Training. The findings of this study are reported.

AD-607 635 Div. 23
OTS Prices: HC $1.00/MF $0.50

Personnel Research Lab. (6570th), Aerospace Medical Div., Lackland AFB, Tex.
CONTRIBUTION OF EDUCATION TO THE RATED EFFECTIVENESS OF WEATHER OFFICERS,
by Chester J. Judy. Jul 64, 15p
Proj. 6755, Task 675502
PRL TDR64 20
Unclassified report

Descriptors: (*Officer personnel, Education), (*Education, Officer personnel), Air force personnel, Effectiveness, Selection, Statistical data, Correlation techniques.

This paper compares accuracy of prediction of officer effectivess ratings from information about educational attainment and from information about the officer's military record (grade, type of commission, source of commission, aeronautical rating). Mulitple regression techniques were applied to data for 1671 weather officers. Results showed that, although military grade and type of commission (regular or reserve) were the best single predictors, both educational level and college major were also significantly predictive of the officer efficiency rating. In combination with all the other variables, educational level still added significantly (.01 level) to prediction, but information about the officer's college major did not. (Author)

AD-607 670 Div. 23
OTS Prices: HC $1.00/MF $0.50

Personnel Research Lab. (6570th), Aerospace Medical Div., Lackland AFB, Tex.
RELATION OF JOB QUALIFICATION RATINGS TO PERFORMANCE RATINGS OF BASIC TRAINING INSTRUCTORS,
Unclassified report
by Llewellyn Wiley. Jul 64, 17p
Proj. 7734, Task 773404
PRL TDR64 21

Descriptors: (*Air force personnel, Performance tests), (*Performance tests, Reliability), Officer personnel, Performance (Human), Achievement tests, Instructors, Personality, Behavior, Selection.

Among the many studies of selection and classification instruments, few have shown high relationship between selection tests and job performance ratings. It was hypothesized that some of the prediction failures could arise from mixing jobs with dissimilar requirements in the criterion data. The job of tactical instructor (TI) was selected to test whether a job requiring all incumbents to perform the same tasks would yield reliable performance data which would be predictable from a battery of qualifications ratings. 55 NCO supervisors rated 527 TIs on overall job performance and on 45 job qualification characteristics. By multiple regression techniques, it was found that characteristics ratings accounted for 75% of the variance in the overall ratings. 3 months later 53 of the supervisors rerated 482 TIs. The correlation between the 2 ratings (reliability) was .72. Overall ratings of 309 TIs by 12 supervisory lieutenants correlated .63 with the reratings. Ratings of the 45 characteristics accounted for 60% of the rerate variance and 50% of the variance of lieutenants' ratings. The findings are consistent with the hypothesis that some of the unpredictability of job performance ratings may be due to mixing dissimilar jobs in collecting criterion data. (Author)

AD-607 680 Div. 23, 5, 8, 12
OTS Prices: HC $5.00/MF $1.25

Systems Research Labs., Inc., Dayton, Ohio.
DEVELOPMENT OF TECHNIQUES FOR EVALUATION OF VISUAL SIMULATION EQUIPMENT.
Final rept. for Mar 62-Apr 64,
by John H. Harshbarger and Arthur T. Gill.
Aug 64, 210p
Contract AF33 657 8299, Proj. 6114, Task 611405
AMRL TDR64 49
Unclassified report

Descriptors: (*Flight simulators, Television display systems), (*Television display systems, Flight simulators), Astronauts, Training devices, Visual signals, Sweep generators, Control panels, Video amplifiers, Brightness, Images, Viewing screens, Photographic analysis, Television cameras, Cathode ray tube screens, Oscilloscopes, Performance (Engineering), Equations.

A study of large area image display by projection television was undertaken to evolve techniques of suitable image generation for astronautical flight simulation training. It was necessary to develop a technique to evaluate projected images. The display provided by the research apparatus, the close-circuit television system from an F-151 Fixed Gunnery Trainer, was evaluated; and performance characteristics of the 7WP4 performance in an ultra-high resolution television system revealed the tube to be unsuited to high resolution service. The projector in the F-151 television system was converted from a conventional 525-line system to a high resolution 1029-line system. The 525-line format operated at 30 frames per second, with a horizonal scanning frequency of 15.75 kc and a vertical scanning frequency of 60 cps. In the 1029-line system, the frame rate and vertical scanning frequency were retained, but the horizontal scanning frequency was changed to 30.87 kc. The vertical sweep generator, sweep protection, and projection control circuits were duplicated; a video amplifier and horizontal sweep

25. Physics

AD-607 413 Div. 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
LONGITUDINAL PLASMA OSCILLATIONS IN AN ELECTRIC FIELD,
by B. D. Fried, M. Gell-Mann, J. D. Jackson, and H. W. Wyld. 27 Jun 59, 36p STL/TR-59-0000-00760
Contract AF04 647 309

Unclassified report

Descriptors: (*Plasma oscillations, Electric fields), (*Electrical fields, Plasma oscillations), Direct current, Electrons, Ions, Statistical functions, Partial differential equations, Integral transforms, Plasma physics.

The properties of longitudinal plasma oscillations in an external electric field are investigated. In a completely linear approximation, it is found that the direct-current electric field introduces essentially no new effects. A quasi-linear approximation is also considered, in which couplings between different plasma modes are neglected while the space-averaged distribution functions are assumed to be approximately independent of time. In this case, a Maxwellian distribution function is found to be always unstable against the growth of very long wavelength oscillations. (Author)

AD-607 416 Div. 25, 2
OTS Prices: HC $4.00/MF $1.00

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
DEPARTURES FROM THE SAHA EQUATION IN AN OPTICALLY THIN NITROGEN GAS,
Technical Information Series,
by J. L. Kulander. Sep 64, 136p R64SD62

Unclassified report

Presented at the 1964 Opacity Conference, Albuquerque, New Mexico, September 3-4, 1964.

Descriptors: (*Nitrogen, Optical properties), Atomic energy levels, Excitation, Gas ionization, Thermodynamics, Electron transitions, Mathematical models.

The populations of the excited and ionized states in an ionized nitrogen gas are calculated for various steady state non-local thermodynamic equilibrium (NLTE) situations. The non-equilibrium conditions basically result from the low electron densities considered. A model consisting of 26 energy levels is assumed for the ions NI -NVIII. The geometrical model consists of a plane-parallel semi-infinite optically thin layer which is assumed to be maintained at a fixed electron temperature and is irradiated by an external Planckian field weakened by a dilution factor, W. Specific densities and temperatures for which LTE holds (for the particle occupations) in N are presented. The electrons are assumed to have a Maxwellian distribution. The populations are presented for electron temperatures, and external radiation temperatures between 10,000 and 100,000K for various W's. (Author)

AD-607 430 Div. 25, 12
OTS Prices: HC $2.00/MF $0.50

General Dynamics/Astronautics, San Diego, Calif.
LIQUID BEHAVIOR IN A ZERO-G FIELD.
Revised ed.,
by Ta Li. Sep 60, 34p AE60-0682
Contract AF18 600 1775

Unclassified report

Descriptors: (*Weightlessness, Liquids), (*Bubbles, Weightlessness), Space environmental conditions, Vapors, Tanks (Containers), Rotation, Stabilization, Heat transfer, Mercury, Geometric forms.

A closed, nonrepellent metal tank was filled with a wall-wetting liquid and its vapor. The principle of minimum surface energy was used to investigate the stable configuration of the liquid in a zero-g field. A solution of the isoperimetrical problem for double integrals was obtained which includes the classical spherical solution as a special case. It was found that if the liquid wets the tank wall, it will cling to it and leave a vapor bubble in the tank. The surface of the bubble is a surface of revolution. The exact shape depends upon the ratio of the volume of the liquid to that of the vapor. The result thus obtained was applied to a tank with a surface of revolution. Conditions are given for the case where the bubble will be a sphere. It was found that the temperature rise on the tank wall will create bubbles tangential to the wall. These bubbles will pulsate until they become large enough to touch each other, then they will coalesce to form a larger bubble which will eventually join the central bubble by contact. Small rotational disturbances were found to have a stabilizing effect. In case of a nonwetting liquid like mercury, it was found that the liquid will detach it self from the wall and form a sphere in the 'center' of the tank.

AD-607 435 Div. 25
OTS Prices: HC $2.00/MF $0.50

Geophysics Corp. of America, Bedford, Mass.
STABILITY OF AN IRRADIATED PLASMA SLAB UNDER CRITICAL POWER LOADING,
by E. T. Florance, R. V. Sillars, and J. I. F. King. Sep 64, 50p
Contract AF30 602 3297, Proj. 5579, Task 557904
RADC TDR64 272

Unclassified report

Descriptors: (*Plasma physics, Statistical mechanics), Ionization potentials, Kinetic theory, Diffusion, Radio-frequency power, Electrons, Distribution, Stability, Functions, Mathematical models, Graphics.

The effects of an upper bound on the ionization frequency for a plasma slab irradiated with intense microwave power are investigated using a Chapman-function model. A quadrature algorithm is developed for the numerical computation of exact steady-state electron density profiles. The results for both stable and unstable profiles are analyzed in terms of a stability condition involving the deposition rate of microwave power. The dynamics of the electron distribution within the slab is treated approximately by constraining the density profiles to a sinusoidal form. A dynamical interpretation of stability then emerges from the approximate electron gain-loss equation. The stability problem is also formulated graphically by the introduction of a potential-like function. Steady-state characteristic curves for the plasma slab are calculated using sinusoidal density profiles; typical contours of constant net electron gain rate are similarly presented. (Author)

AD-607 444 Div. 25
OTS Prices: HC $2.00/MF $0.50

Westinghouse Research Labs., Pittsburgh, Pa.

A pilot study was undertaken by the AUERBACH Corporation for the Department of Labor to determine the future manpower requirements for Technical Information Support Personnel (TISP) to scientists and engineers in the Communications Equipment industry (SIC 366). The study uses the case study technique in eight selected companies to define the functions and skill requirements of TISP, to estimate the present number of TISP in SIC 366, and to forecast the number of TISP required through 1970. The study also tests the methodology used and recommends improved methods for further study in other industries. (Author)

24. Photography and Other Reproduction Processes

No Entries

waves in physics, (2) Dielectric relaxation of dilute solutions in the millimeter-wave region, (3) Determination of the collison frequency of free electrons in flames by microwave absorption measurements, (4) measurements of free electrons in flames.

AD-607 492 Div. 25, 8
OTS Prices: HC $1.00/MF $0.50

Shockley Transistor Div., Clevite Transistor, Palo Alto, Calif.
RESEARCH ON SEMICONDUCTOR TRANSPORT.
Annual summary rept. for 1 Oct 63-30 Sep 64.
30 Sep 64, 4p
Contract Nonr2934 00

Unclassified report

Descriptors: (*Semiconductors, Transport properties), (*Phonons, Scattering), (*Crystal lattices, Vibration), Silicon, Quantum mechanics, Electrons, Electric fields, Acoustics, Carbon.

The work is concerned with the exploration of interaction of phonons (lattice vibrations) with charge carriers and effects closely related to these. The first major accomplishment was the discovery of the transmitted phonon drag in silicon npn structures. Subsequently, the transmitted phonon drag was used to explore a variety of scattering phenomena, all in silicon. During the first phase, the transmitted phonon drag was investigated using electrical input field of less than 10 volts/cm. Recently, main emphasis was put on 'high field' experiments in which electrons interacting with the phonons are accelerated to those drift velocities which are larger than the sound velocity in silicon. (Author)

AD-607 517 Div. 25, 13
OTS Prices: HC $4.00/MF $0.75

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
EXPERIMENTS ON THE VIBRATION OF THIN CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE,
by Y. C. Fung, A. Kaplan, and E. E. Sechler.
15 Dec 5, 105p AM-5-9

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Structural shells, Vibration), (*Cylindrical bodies, Vibration), Pressure, Frequency, Damping, Elastic shells, Theory, Tables, Mathematical analysis.

Experimental results on the frequency spectra, vibration modes, and structural damping of a series of thin-walled cylinders subjected to internal pressure are presented. Within the estimated accuracy, the experimental results show good agreement with the features predicted by the linear theory of elastic shells. (Author)

AD-607 518 Div. 25, 7
OTS Prices: HC $3.00/MF $0.75

MHD Research, Inc., Newport Beach, Calif.
EXPLOSIVE MAGNETOHYDRODYNAMICS.
Quarterly technical progress rept. no. 2, 1 Jul-30 Sep 64,
by Malcolm S. Jones, Jr., Francis H. Webb, Jr., Paul Webster, Sydney Handlin, and David Komaroff.
14 Oct 64, 97p MHD-660
Contract AF33 615 1594, Proj. 8173, Task 817306

Unclassified report

See also AD-602 811.

Descriptors: (*Magnetohydrodynamics, Generators), (*Electric power production, Magnetohydrodynamics), Energy conversion, Explosions, RDX, Plastic explosives, Charges (Explosive), Geometric forms, Plasma medium, Additives, Electric conductance, Inductance, Magnetic fields, Circuits.

Experimental and theoretical studies of explosive driven MHD generators are reported. Experimental studies in a 1 x 4 inch linear channel covered explosive charge geometry effects, various seed materials, plasma conductance, and a determination of the plasma inductance. A radial explosive driven MHD generator experiment is described and theoretical relations are developed. (Author)

AD-607 521 Div. 25
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
THE INTERNAL PRESSURE REQUIRED IN A THIN CYLINDRICAL SHELL UNDER BENDING AND COMPRESSION, TO ATTAIN A CONTROLLED AND STABLE REGION OF CRIPPLING,
by H. W. Baer. 25 Jul 55, 15p RW-66-33

Unclassified report

Descriptors: (*Structural shells, Pressure), (*Cylindrical bodies, Pressure), Stresses, Deformation, Loading (Mechanics), Control, Stability, Compressive properties.

A thin-walled cylindrical shell is subjected to bending, compression and enough internal pressure to limit crippling to a specified region of the shell. The assumption is made that the bending stress is uniform in the crippled region, varies linearly in the uncrippled region, and its intensity in tension and compression is such that the internal resisting load equals the externally applied load. The geometry of the shell is assumed such that the crippling loads are well within the elastic range. As a result of the above assumptions, bending stress coefficients are evolved which permit the computation of the required pressure to limit crippling to a specified region. With the applied loadings fixed, the shell thickness must be such that the tensile yield allowable stress is not exceeded in either the longitudinal or the circumferential direction. Formulas are given to enable a check that the latter condition is maintained. As the crippled region is allowed to extend, the required internal pressure may be decreased until one third of the skin is crippled. A further increase of the crippled region requires an increased internal pressure, however. (Author)

AD-607 550 Div. 25, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
EFFECTS OF INTERNAL PRESSURE ON THE BUCKLING OF CIRCULAR CYLINDRICAL SHELL UNDER BENDING,
by V. Weingarten. May 61, 27p
STL-7102-0033-RU-000; EM-11-12
Contract AF04 647 619
AFBMD TR61 27

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Structural shells, Cylindrical bodies), (*Cylindrical bodies, Buckling (Mechanics), (*Buckling (Mechanics), Cylindrical bodies), Compressive properties, Pressure, Theory, Stresses, Mathematical analysis, Hydrostatic pressure.

SPIN RELAXATION OF E' CENTERS: TEMPERATURE DEPENDENCE IN GeO2 GLASS.
Scientific rept. no. 2,
by J. G. Castle, Jr., D. W. Feldman, and J. Murphy.
Oct 64, 28p
Contract AF19 628 3838, Proj. 4608, Task 460801
AFCRL 64 598

Unclassified report

Descriptors: (*Germanium compounds, Dioxides), (*Nuclear spins, Relaxation time), Crystal lattice defects, Color centers, Strain, Nuclear magnetic resonance, Phonons, Electrons.

Measurements of the spin relaxation time, , of E' centers in germania glass were made at 3 kOe for temperatures from 1.2°K to 25°K. An accurate fit to the data is obtained by the expression $1/ = A + BT + C/(e^{x_1} - 1)^{-1}$ where the same activation temperature of x T = 11 ± 2°K applies to both the samples tested. One sample had A = 0, B = 0.6 $sec^{-1}°K^{-1}$, and C = 240 sec^{-1}; the other, values about 1.5 times larger. An interpretation is discussed in terms of the local strain at the site of each E' center having a large value for phonon frequencies approximately equal to that of a localized mechanical resonance mode. (Author)

AD-607 446 Div. 25
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
A MANUAL FOR WAVEFORM ANALYSIS,
by Alice W. Mathewson. Jan 52, 27p
DTMB 794

Unclassified report

Descriptors: (*Instruction manuals, Harmonic analysis), (*Harmonic analysis, Instruction manuals), Wave analyzers, Vibration, Sound, Electricity, Numerical analysis, Potential theory.

In the analysis of vibration records a laborious harmonic analysis may frequently be avoided by direct comparison of the records with the waveforms obtained by combining simple harmonic functions of various frequencies, phase relations, and amplitudes. A reasonably accurate harmonic analysis of such records is essential for their interpretation. The purpose of this manual is to present a simple guide for the approximate analysis of such records. A group of sample curves and their sinusoidal components, which represent the most frequent forms encountered, has been plotted for the convenience of technical personnel in the fields of vibration, sound, and electricity. The waveforms included are combinations of the fundamental and higher harmonics up to and including the fourth harmonic. Each combination is plotted for phase angles from 0 to 2 Pi taken in increments of Pi/4.

AD-607 457 Div. 25
OTS Prices: HC $2.00/MF $0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
MEMBRANE AND BENDING STRESSES IN SHALLOW, SPHERICAL SHELLS.
Technical rept.,
by F. Y. M. Wan. 11 Aug 64, 48p LL-TR-317
Contract AF19 628 500
ESD TDR64 362

Unclassified report

Descriptors: (*Elastic shells, Stresses), Spheres, Loading (Mechanics), Deformation, Boundary value problems, Mechanics, Mathematical analysis.

The present work is concerned with the nature of the interior solution and the influence coefficients of shallow, spherical, thin, elastic shells (or equivalently a shallow, thin, elastic, paraboloidal shell of revolution) which are homogeneous, isotropic, closed at the apex, and of uniform thickness. The investigation is carried out within the framework of the usual shallow shell theory for small displacements and negligible transverse-shear deformations. Exact interior solutions are obtained for shells acted upon by edge loads and edge moments. The constants of integration associated with these interior solutions are expanded asymptotically in inverse powers of a large parameter. Retaining only the leading term of these expansions leads (in most cases) to known approximate results. Explicit expressions for the second-order terms are obtained. It is shown that these second-order terms play a significant role in a certain class of problems. The relative importance of the membrane and inextensional bending stresses in the interior of the shell is discussed. The exact and asymptotic influence coefficients are obtained. The interior stress state of shells subjected to polar harmonic axial surface loads is also investigated by the same procedure. (Author)

AD-607 458 Div. 25, 9
OTS Prices: HC $1.00/MF $0.50

Little (Arthur D.) Inc., Cambridge, Mass.
THE ACTIVATION ENERGY OF VISCOUS FLOW OF PURE WATER AND SEA WATER IN THE TEMPERATURE REGION OF MAXIMUM DENSITY.
Technical rept. no. 4,
by R. A. Horne, R. A. Courant, D. S. Johnson, and F. F. Margosian. 31 Oct 64, 19p
Contract Nonr4424 00, Proj. NR051 460

Unclassified report

Prepared for publication in The Journal of Chemical Physics.

Descriptors: (*Heat of activation, Viscosity), (*Viscosity, Fluid flow), (*Fluid flow, Heat of activation), Sea water, Water, Density, Temperature, Electrolytes, Electrical conductance, Transport properties.

The viscosity of pure water and sea water have been measured at one atmosphere over the temperature range -2 to +12C. The temperature-dependence of the activation energy of viscous flow of water and aqueous electrolytic solutions, unlike that of the activation energy of the electrical conductivity of aqueous solutions of salts, does not exhibit a maximum near the temperature of maximum density. This dissimilarity casts doubt upon the hypothesis that viscous flow and 'normal' electrical conductivity both have the same slow step, namely, 'hole'-formation in the water. (Author)

AD-607 465 Div. 25
OTS Prices: HC $4.00/MF $0.75

Microwave Lab., Duke Univ., Durham, N. C.
DUKE MICROWAVE LABORATORY REPORT NO. 28, NOVEMBER 1, 1959-FEBRUARY 1, 1960.
1 Feb 60, 101p
Contract AF18 600 497, Proj. R357 10 6

Unclassified report

Descriptors: (*Microwave spectroscopy, Reports), Bibliographies, Millimeter waves, Physics, Solutions, Dielectric properties, Transport properties, Electrons, Flames, Measurement.

Contents: (A) Papers published during period of contract; (B) Technical reports - (1) Millimeter and submillimeter

features of the problem and is more susceptible to numerical analysis.

AD-607 591 Div. 25
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
TRANSIENT RESPONSE OF A RIGID SPHERICAL INCLUSION IN AN ELASTIC MEDIUM,
by C. C. Mow. Oct 64, 33p P-3001
Unclassified report

Descriptors: (*Solids, Elasticity), (*Elasticity, Mechanical waves), (*Mechanical waves, Spheres), Motion, Density, Integrals, Boundary value problems, Equations, Functions, Integral transforms, Mechanics, Mechanical properties.

The transient response of a rigid spherical inclusion of arbitrary density embedded in an elastic medium due to an incident pulse is examined. The Fourier-integral method is used, and an exact solution of the response is obtained. It is found that the acceleration and velocity of the inclusion are substantially different from those of the medium. A slight difference in the time history of the displacement between the inclusion and the medium is also noted. (Author)

AD-607 607 Div. 25
OTS Prices: HC $5.00/MF $1.00

Space Technology Labs., Inc., Los Angeles, Calif.
THERMODYNAMIC PROPERTIES OF AIR FROM 1000K TO 10,600K ALONG CONTOURS OF CONSTANT DENSITY, ENTHALPY, AND ENTROPY,
by M. W. Curtis and H. E. Wohlwill. 3 Mar 61, 152p
STL-7102-0012-MU-000
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Air, Thermal properties), (*Thermodynamics, Tables), Density, Enthalpy, Entropy, Pressure, Temperature, Sound, Velocity.

The gas properties given in the report were computed from tables of thermodynamic properties furnished by the National Bureau of Standards. The NBS data have appeared as NBS(1959). It was the purpose of the computation to tabulate properties along isentropes and along constant enthalpy contours, based on the NBS data which are given along isotherms. (Author)

AD-607 608 Div. 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THERMODYNAMIC PROPERTIES OF AIR FROM 9500K TO 14,800K ALONG CONTOURS OF CONSTANT DENSITY, ENTHALPY, AND ENTROPY,
Addendum to rept. STL-7102 0012 MU 000,
by M. W. Curtis and H. E. Wohlwill. 21 Jun 61, 48p
STL-7102-0012-MU-A01
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Air, Thermal properties), (*Thermodynamics, Tables), Density, Enthalpy, Entropy, Pressure, Temperature, Sound, Velocity.

The tables represent an addendum to AD-607 607. In the computations for the 'Addendum' an attempt was made to provide sufficient overlap that the derivatives and the speed of sound values near the junction between the tables are the same as they would have been if the entire computations had been carried out in one pass on the machine. (Author)

AD-607 617 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE STABILITY OF PLASMAS IN THE PRESENCE OF CONDUCTING WALLS,
by Carl Iddings. 9 Sep 60, 23p
STL/TR-60-0000-94316
Contract AF04 647 594
PB 154 372
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. Page 1 of abstract missing.

Descriptors: (*Plasma medium, Stability), Containers, Electrical conductance, Gravity, Magneti fields, Magnetohydrodynamics, Vector analysis, Special functions (Mathematical).

The report analyzes two situations where conducting surfaces are present. In the first, a plasma, bounded between two perfectly conducting walls, is supported against gravity by a magnetic field. The gravitational field is simply to simulate the centrifugal force on particles moving on curved lines of force or the field gradient forces, without complicating the geometry. The second situation is a wedge-shaped section of a cylindrical column of plasma, confined between perfectly conducting walls. It is assumed that there is no magnetic field inside the plasma and that there is an azimuthal field outside the plasma. Both situations turned out to have unstable solutions, although the instabilities are not so'bad' as without conductors in the sense that some of the unstable modes are eliminated.

AD-607 620 Div. 25
OTS Prices: HC $1.00/MF $0.50

General Dynamics/Convair, San Diego, Calif.
HEAT TRANSFER RATE IN LIQUID OXYGEN,
by H. W. Wegener and T. H. Buckley. 1 Jun 55, 7p
GDC-9516
Unclassified report

Descriptors: (*Liquified gases, Oxygen), (*Heat transfer, Liquified gases), (*Oxygen, Heat transfer), Test methods, Experimental data, Tests, Air Films, Thermocouples, Insulations, Tanks (Containers).

The object was to determine: (1) the overall coefficient of heat transfer between ambient air and liquid oxygen in a thin walled tank, (2) the film coefficient between ambient air and a tank of liquid oxygen, and (3) the film coefficient between a tank wall and liquid oxygen. A 0.125 inch 61ST aluminum tank 4 ft. high, 2 ft. in diameter was used to contain the liquid oxygen. The top and bottom of the tank were insulated with 62 inch fiberglass. Investigations were made under three conditions: (A) Average wind velocity normal to tank equal to zero. (B) Average wind velocity normal to tank equal to 7.1 MPH. (C) Average wind velocity normal to tank equal to 13.6 MPH. The tank was mounted on a platform scale (see Figure2) to measure the oxygen boiloff. The tank was refilled at the start of each test condition. Thermocouples on the inner and outer surfaces

The effect of internal pressure on the stability of thin walled cylinders under pure bending is investigated by means of modified Donnell equation. The results indicate that, unlike the results for the case of pressurized cylinders under compression, the critical maximum compression stress due to bending increases with internal pressure. The theoretically predicted increases are much less, however, than those obtained experimentally. (Author)

AD-607 551 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
SCATTERING OF ELASTIC WAVES BY SMALL INHOMOGENEITIES,
by John W. Miles. 19 Oct 59, 15p
STL/TN-59-0000-00323; EM-9-19

Unclassified report

Descriptors: (*Mechanical waves, Scattering), Acoustics, Elasticity, Dipole moments, Quadrupole moments.

Rayleigh scattering theory is extended to determine the perturbation on an arbitrarily prescribed elastic wave field produced by small inhomogeneities in an otherwise homogeneous, isotropic medium. The general result is applied to the specific problems of the scattering of both plane P- and S-waves. It is found that a change in compressibility acts at a distance as a simple source and a change in density as a dipole, as in the acoustical problem, while a change in shear modulus contributes both simple-source and quadrapole fields. (Author)

AD-607 569 Div. 25, 7
OTS Prices: HC $0.50/MF $0.50

Naval Research Lab., Washington, D. C.
SOURCE CONTAMINATION EFFECTS ON THE EPITAXY OF Ge FILMS ON Ge.
Final rept.,
by J. E. Davey. 28 Sep 64, 28p
Proj. RR008 03 46 5673
NRL 6159

Unclassified report

Descriptors: (*Germanium, Films), (*Metal films, Contamination), Single crystals, Epitaxial growth, Impurities, Tungsten, Graphite, Quartz, Carbon, Aluminum compounds, Oxides, Vapor plating, Evaporation, Crystal substructure, X-ray diffraction analysis, Electron diffraction analysis, Electrical properties, Hall effect.

The effect of source contamination on the structure of Ge films deposited simultaneously onto single-crystal Ge substrates and amorphous quartz Hall substrates was investigated. Deposition from the refractory metals, from quartz crucibles, and from extensively outgassed and vacuum-loaded graphite crucibles produce single-crystal films when deposited at a substrate temperature of 350 C; the electrical properties of the films deposited simultaneously onto the Hall substrates are typical of Ge films with good structural properties. Deposition from unoutgassed graphite crucibles (either resistive or radiative heating) and A12O3 in either crucible or cataphoretic form, produce films ranging from amorphous to polycrystalline when deposited on single-crystal Ge at 350 C. Evaporations from these latter materials will produce single-crystal films on Ge single crystals only for extensive vacuum outgassing and vacuum loading of the Ge charge and for substrate temperatures in excess of 500 C. (Author)

AD-607 571 Div. 25, 4
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
THE CONTRIBUTION OF GENERALLY-NEGLECTED BAND SYSTEMS AND CONTINUA TO THE ABSORPTION COEFFICIENT OF HIGH-TEMPERATURE AIR,
by F. R. Gilmore. Oct 64, 26p RM-4335-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Air, Absorption spectrum), (*Molecular spectroscopy, Air), High-temperature research, Band spectrum, Continuous spectrum, Spectra (Infrared), Spectra (Visible and ultraviolet), Photochemistry, Gas ionization, Nitrogen, Nitrogen compounds, Oxides, Oxygen, Cyanogen, Nuclear explosions, Exhaust flames.

The molecular band systems and continua which contribute to the absoprtion coefficient of air between 2000 and 8000K are discussed. In the vacuum ultraviolet the major contributors are the oxygen Schumann-Runge continuum, several band systems of nitrogen and nitric oxide, and the photoionization continua of all three molecules. In the near ultraviolet and visible region, in addition to the band systems of N2, N2(+), NO and O2 generally considered, the systems of NO2 and CN are shown to be important. In the infrared there are many band systems which may contribute, and further work is needed to determine their relative importance. (Author)

AD-607 572 Div. 25
OTS Prices: HC $1.00/MF $0.50

Tufts Univ., Medford, Mass.
MICROWAVE PRESSURE BROADENING. SUDDEN PERTURBATION APPROXIMATION.
Technical rept.,
by Carl O. Trindle and Karl H. Illinger. 30 Sep 64, 14p
Contract Nonr494 19, Proj. NR014 240

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from the best available copy.

Descriptors: (*Perturbation theory, Transport properties), (*Transport properties, Perturbation theory), (*Microwave spectroscopy, Molecular spectroscopy), Pressure, Energy, Quantum mechanics, Potential theory, Quantum statistics, Molecules.

The raison d'etre of studies of pressure broadening is the search for the quantitative characterization of molecular interaction. In principle, a molecule undergoing a spectroscopically observable transition serves as a highly sensitive probe of the force field of its environment. The ligament between the results of spectroscopic experiments and their interpretation in terms of intermolecular forces is the theory of pressure broadening. At microwave frequencies, the region of rotational and inversion lines in molecules, experiment holds the promise of yielding the greatest amount of information, owing to the sensitivity of such transitions to molecular interaction. A theory which has dealt rather successfully with the problem of pressure-broadened microwave transitions, including diabatic effects, is that due to Anderson. In spite of the simplicity of its underlying assumptions (classical path, zero collision time, two-body collisions, and a minimum separation), the formalism of this theory leads to an elaborate computational apparatus. The present work explores the question as to whether a less elaborate formalism, arising from the use of the sudden approximation in perturbation theory, can lead to a theory of microwave pressure broadening which retains the salient physical

Descriptors: (*Gas ionization, Measurement), Electrons, Instrumentation, Electron lenses, Electron multipliers, Pulse discriminators, Mass spectroscopy, Spectrum analyzers, Signal-to-noise ratio.

Work was devoted to improving the existing equipment. Work areas included the completion and testing of an ultra-high-gain electron multiplier, the installation of a new quadrupole lens, construction of a simple gas test source, testing of the spectrometer, construction of a new pulse quantizer, theoretical exploration of the ion transmission between the spectrometer and the electron multiplier and studies of the data-handling problems in the pulse electronics. Except for a tendency to short out, the new electron multiplier operates satisfactorily, whereas the new quadrupole lens does not. The pulse electronics has yet to be connected to the multiplier output. Measurement of ionization cross sections is still several months distant. (Author)

AD-607 664 Div. 25, 8
OTS Prices: HC $2.00/MF $0.50

Electronics Research Lab., Univ. of California, Berkeley.
AN X-BAND INTERFEROMETER.
Rept. for Sep 62-Feb 63,
by R. E. Pechacek. 15 Feb 63, 29p ERL-63-2
Contract AF33 657 7614, Proj. 4150, Task 415001
AF TDR64 167

Unclassified report

Descriptors: (*Interferometer, Plasma physics), (*Plasma physics, Interferometer), Design, X-band, Microwave equipment, Mixers (Electronic), Modulators, Phase shifters, Diodes, Discriminators, Electric bridges, Klystrons, Oscillators, Signal to noise ratio, Power supplies, Intermediate frequency amplifiers, Radiofrequency, Signal, Mathematical analysis, Combinatorial analysis.

An interferometer for use in plasma diagnostics is described. A single klystron provides both the transmitter power and the local oscillator signal for a heterodyne receiver. The heterodyne receiver provides a greatly reduced noise figure, and the output signal is independent of the amplitude of the received signal. This technical documentary report has been reviewed and is approved. (Author)

AD-607 699 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ON THE DETECTION OF ION OSCILLATIONS IN A MERCURY DISCHARGE,
by Burton D. Fried and Roy W. Gould. 9 Dec 60, 16p STL/TR-60-0000-GR413
PB 154 371

Unclassified report

Descriptors: (*Plasma oscillations, Determination), (*Gas discharges, Plasma oscillations), Ions, Oscillation, Damping, Mercury, Vapors, Transport properties.

The possibility of using a low pressure mercury discharge to detect ion plasma oscillations was examined. It was found that 1) collisions will not interfere with the phenomenon; 2) the current which maintains the discharge will cause the waves to grow (through the two-stream instability) in a time comparable with or less than the oscillation period. Aside from complications caused by the fact that the maximum growth occurs at rather short wavelengths, detection of these waves appears quite feasible. (Author)

AD-607 700 Div. 25
OTS Prices: HC $3.00/MF $0.75

Sperry Gyroscope Co., Great Neck, N.Y.
INVESTIGATION OF OPTICAL FREQUENCY TRANSLATION TECHNIQUES.
Final technical rept.,
by J. K. Sharp and E. O. Vaher. Sep 64, 74p
AB-1272-0013
Contract AF33 657 11653, Proj. 5191, Task 519102
AL TDR64 226

Unclassified report

See also AD-606 643.

Descriptors: (*Lasers, Design), Optical equipment, Optical filters, Mirrors, Neodymium, Impurities, Multiple operation, Light, Polarization, Magneto-optic effect, Interferometers, Optical properties, Feasibility studies.

Various techniques of optical frequency translation were investigated, leading to the design of a Y-shaped laser configuration that can simultaneously support independent oscillations having two separate polarizations. The device consists of two laser cavities sharing a single neodymium-doped glass laser rod and end mirror. Theoretical and experimental studies of mode selection techniques and Fabry-Perot interferometric analyzers are presented. The work leads to single-mode operation for each separate frequency and effective methods of measuring translation. Tuning a single leg of the Y laser, translation over a total range of 18 Gc was achieved. Observation of simultaneous operation of both legs was also made. It was concluded that the method selected was feasible and that further effort is warranted. (Author)

AD-607 701 Div. 25, 30
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
THE ELECTRICAL CONDUCTIVITY OF AIR UP TO 24,000K,
by Rudolf X. Meyer. 26 Jun 58, 14p
STL/GM-TR-0127-00420
Contract AF04 647 127

Unclassified report

Descriptors: (*Electrical conductance, Air), (*Air, Electrical conductance), (*High-temperature research, Electrical conductance), Thermodynamics, Magneto hydrodynamics, Shock waves, Mathematical prediction, Temperature, Density, Transport properties, Velocity.

The electrical conductivity of air in thermodynamic equilibrium at temperatures up to about 7,000K is known with considerable reliability from shock tube experiments reported by Lamb and Lin. These data have been used to compute the conductivity directly as a function of temperature and density. In this case, the contribution of the positive ions to the total electron collision probability is still relatively small, but becomes increasingly important at higher temperatures. In this paper estimates of the conductivity up to 24,000K are computed. This upper limit was decided upon because it coincides with the limit of Gilmore's computations of the equilibrium composition of air.

AD-607 712 Div. 25
OTS Prices: HC $2.00/MF $0.50

California Univ., La Jolla.
QUANTUM DENSITY OSCILLATIONS IN AN INHOMOGENEOUS ELECTRON GAS.
Technical rept. no. 27,

of the insulated top and bottom were used to determine the heat influx through these tank areas. Temperature measurements from all thermocouples were taken as often as possible with two Leeds and Northrop null balance poteniometers.

AD-607 621 Div. 25
OTS Prices: HC $1.00/MF $0.50

Crystal Physics Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF CRYSTAL GROWTH OF PURE AND DOPED METAL OXIDES.
Final scientific rept. (Technical rept. no. 4) for 1 Jun-30 Nov 63,
by E. F. Farrell and A. Linz. 1 Sep 64, 18p
Contract AF19 628 2971, Proj. 4645, Task 464502
AFCRL 64 724

Unclassified report

Descriptors: (*Crystal growth, Spinels), (*Spinels, Crystal growth), Magnesium compounds, Oxides, Aluminum compounds, Chromium compounds, Impurities, Crystals, X-ray diffraction analysis, Chemical analysis, Crystal structure.

The purpose of this research was to investigate the growth and some physical properties of spinel crystals as a function of stoichiometry. Both pure and Cr3+ doped spinels were to be studied. Since there were considerable problems associated with the growth and chemical analysis of these crystals, this research was restricted to determining growth conditions and analytical methods. (Author)

AD-607 623 Div. 25
OTS Prices: HC $5.00/MF $1.00

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF EQUATION OF STATE OF POROUS MATERIAL,
by G. R. Fowles. Aug 64, 152p
Contract AF29 601 6024, Proj. 5710, Task 571083B
WL TDR64 59

Unclassified report

The initial distribution copies contain color which will be shown in black-and-white when it is necessary to reprint.

Descriptors: (*Equations of state, Porous materials), (*Porous materials, Equations of state), Soils, Deserts, Phase studies, Pressure, Thermodynamics, Geometry, Shock waves, Hydrodynamics, Density, Propagation, Programming (Computers), Model tests.

Hugoniot data in the pressure range 40 to 500 kbar for porous playa from Area 5 of the Nevada Test Site are obtained by impedance-match methods using both in-contact and flyer-plate explosive arrangements. Two initial densities, 1.55 and 1.95 g/cu cm (crystal density, 2.66 g/cu cm), of dry, reconstituted materials are examined. The data show regions in which the pressure is multivalued. This behavior is attributed to polymorphic phase transitions in one or more of the constituent minerals. A simple, closed form expression for the zero-degree isotherm is presented which converges asymptotically to the behavior of a free-electron gas at extreme pressure. It also contains the principal term representing the pressure-volume behavior predicted by the Thomas-Fermi model. Interpolation terms are added to fit known zero-pressure quantities, viz., initial density, compressibility, and sublimation energy. In addition an extensive review of the thermodynamics of equations of state is presented. Results of shock calculations in spherical geometry assuming hydrodynamic behavior of the medium are also presented. These calculations are intended to indicate the sensitivity of shock decay to uncertainties in the equation of state. The varied parameters include porosity, Gruneisen's ratio, and the zero-degree isotherm. No large influence on shock decay due to these variations is evident. (Author)

AD-607 632 Div. 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
NUCLEATE BOILING. A LITERATURE SURVEY OF UNCLASSIFIED REPORTS,
by James R. Trew. 15 Mar 60, 35p STL-B-31, STL/GM-60-5111-3

Unclassified report

Descriptors: (*Nucleate boiling, Reviews), Heat transfer, Bubbles, Thermodynamics, Bilbiographies, Abstracting.

Sixty-four abstracts of papers from the open literature and government reports are included.

AD-607 638 Div. 25
OTS Prices: HC $3.00/MF $0.75

Philips Labs., Inc., Irvington-on-Hudson, N. Y.
RESEARCH ON X-RAY DETERMINATION OF PRECISION LATTICE PARAMETERS.
Final rept.,
by William Parrish, Marian Mack, and Jeanne Taylor.
30 Jun 62, 81p Philips-TR-156, Philips-Case-14-142
Contract AF49 638 620
AFOSR 3082

Unclassified report

Descriptors: (*Crystal lattices, X-ray diffraction analysis), Crystal structure, Line spectrum, Spectroscopy, Center of gravity, Potassium, Tungsten, Errors.

The application of the centroid method to powder line profiles obtained with the X-ray diffractometer is shown to lead to lattice parameters which are independent of the diffraction angle. Thus it appears that the lattice parameter is free of systematic errors and that the centroid method has properly accounted for the aberrations which distort and shift the line profile. The instrumentation and methodology necessary for results of the highest precision are discussed. The effect of interferences from the Kalpha3,4 satellites and Kbeta lines is described. Three different methods that have been proposed for the determination of centroids were investigated and applied to both spectral and powder line profiles, and the necessity for 'equivalence' between the centroids of the spectral profile and the line profile is discussed. The line shapes and the centroids of observed and analytic spectral profiles are compared for both CuKalpha and FeKalpha radiations. (Author)

AD-607 661 Div. 25
OTS Prices: HC $1.00/MF $0.50

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
ELECTRON-IONIZATION CROSS SECTIONS.
Semiannual progress rept. no. 1, 15 Jun-15 Dec 63,
by C. K. Crawford and C. E. Woodward. 15 Dec 63, 18p
Contract AF33 657 10939

Unclassified report

Extension of Contract AF33 616 8358.

by A. Mesnager. 9 Oct 64, 65p
RSIC 305; TT 64 71635

Unclassified report

Trans. of Annales des Ponts et Chaussees (France) 1901, ser. 8, v. 4, no. 50, p. 129-190.

Descriptors: (*Deformation, Elasticity), (Glass, Deformation), (*Elasticity, Theory), Stresses, Solids, Structural parts, Beams (Structural), Floors, Mathematical analysis, Refraction, France.

A theoretical study was made of the elastic deformation of solids, and structural materials in particular. The theory of elasticity was recapitulated. A method of measuring internal stresses in glass was discussed. New formulas developed were applied to floors formed of rough plaster joined with the beams. The rupture of breakable bodies was mentioned.

AD-607 746 Div. 25
OTS Prices: HC $1.00/MF $0.50

J. G. Engineering Research Associates, Baltimore, Md.
POST FAILURE DEFLECTIONS OF CYLINDRICAL SHELLS UNDER DYNAMIC LATERAL LOADS.
Technical rept. no. 5,
by Joshua E. Greenspon. Aug 64, 13p
Contract DA36 034ORD3081X

Unclassified report

Descriptors: (*Structural shells, Loading (Mechanics)), (*Deformation, Structural shells), Cylindrical bodies, Buckling (Mechanics), Tensile properties, Structures, Mathematical analysis, Mathematical prediction.

The general work-energy approach for calculating plastic deformations is treated. Curves are presented for energy absorbed by cylindrical shells as a function of post failure deflection for both collapse and buckling failure. A set of curves is also given for predicting whether a shell will collapse or buckle first.

AD-607 766 Div. 25
OTS Prices: HC $2.00/MF $0.50

Boeing Scientific Research Labs., Seattle, Wash.
X-RAY ABSORPTION FINE STRUCTURE IN CRYSTALLINE AND NON-CRYSTALLINE MATERIALS,
by Farrel W. Lytle. Jul 64, 38p D1-82-0361

Unclassified report

Presented at the International Conference on Physics of Non-Crystalline Solids, Delft, Jul 64.
Also available from the author.

Descriptors: (*X-ray absorption analysis, Materials), (*Materials, X-ray absorption analysis), (*Absorption, X-rays), Electron transitions, Crystal structure, Crystals, Solids, Temperature, Electrons, Quantum mechanics, Germanium, Oxides, Selenium, X-ray diffraction analysis, Density, Spectrum analyzers, Single-crystals, Scintillation counters, Pulse height analyzers, X-ray tubes.

The fluctuations of absorption coefficient which appear on the high energy side of x-ray absorption edges have been separated historically and physically into two different but similar effects. The structure in and near the edge (Kossel structure) has been explained by electron transitions from inner levels to unfilled atomic levels of the atom involved in the absorption event. On the other hand, the extended x-ray absorption fine structure beginning near the edge and extending many hundreds of electron volts must be due to electron transitions to levels belonging to the molecule, near neighbors, or cyrstal as a whole. Although many attempts have been made, most x-ray spectroscopists agree that a satisfactory theory has yet to be advanced. It is the purpose of this paper to introduce a partially phenomenological theory and to analyze extended x-ray absorption fine structure data from a number of crystalline and non-crystalline solids.

AD-607 778 Div. 25
OTS Prices: HC $2.00/MF $0.50

North Carolina State Coll., Raleigh.
GROWTH AND DEFORMATION MECHANISMS IN SINGLE CRYSTAL SPINEL.
Final rept. for Aug 62-Jun 64,
by Hayne Palmour, III, R. Douglas McBrayer, David E. Witter, and W. Wurth Kriegel. Sep 64, 47p
Contract AF33 616 7820, Proj. 7350, Task 735001
ML TDR64 284

Unclassified report

Descriptors: (*Spinels, Deformation), (*Single crystals, Spinels), (*Crystal growth, Single crystals), Heat treatment, Aluminum compounds, Oxides, Compressive properties, High-temperature research, Tensile properties.

This final report of a program of research on growth and deformation processes in spinel includes a description of an R. F. plasma growth facility and its operation. The main conclusion from the growth experiments is that the instability of spinel at its melting point precludes the growth of large stoichiometric single crystals by direct fusion. Alternative techniques are discussed. The effect of heat treatment on the microindentation behavior and room temperature compressive strength of alumina-rich spinel single crystals is discussed. Some high temperature strength data on alumina-rich spinel are included. (Author)

AD-607 783 Div. 25
OTS Prices: HC $1.00/MF $0.50

Electronics Research Lab., Univ. of California, Berkeley.
LASER BEAM EXCITATION OF LASERS.
Final rept.,
by J. R. Singer. 31 Aug 64, 8p ERL-64-33
Grant DA ARO D31 124G317, Proj. 009925001
AROD 3323p

Unclassified report

Descriptors: (*Lasers, Excitation), Reviews, Bibliographies.

Theoretical and experimental investigations of the 180 degree pulse for laser excitation are briefly summarized.

AD-607 786 Div. 25
OTS Prices: HC $3.00/MF $0.75

California Univ. [Berkeley].
KNIGHT SHIFT AND NUCLEAR RELAXATION TIMES IN LIQUID GALLIUM.
Doctoral thesis,
by David Allan Cornell. Jun 64, 72p

Unclassified report

Descriptors: (*Gallium, Solid state physics), (*Relaxation time, Gallium), Magnetic properties, Liquids, Nuclear magnetic resonance, Magnetic fields, Nuclear spins, Temperature, Conductivity, Electrons.

by W. Kohn and L. J. Sham. 23 Oct 64, 37p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Plasma oscillations, Theory), Electrons, Gases, Quantum statistics, Potential theory.

An infinite system of electrons in its ground state, subject to a very slowly varying external potential, has slowly varying properties and can be described by a gradient expansion theory. However, when in addition either (1) there is a spatially rapidly varying perturbing potential or (2) there are regions in which the electron density drops to zero (e.g., electrons in an oscillator potential), the density and other properties of the system exhibit additional spatial oscillations, which we call quantum oscillations. An example are the Friedel oscillations in metals. A general theory is developed concerning these oscillations for one-dimensional, non-interacting electrons. Illustrations are worked out which show that when the quantum oscillations are superposed on the smooth 'semiclassical' results, one can obtain very accurate approximations to the exact densities. (Author)

AD-607 713 Div. 25
OTS Prices: HC $1.00/MF $0.50

California Univ., La Jolla.
THERMAL PROPERTIES OF THE INHOMOGENEOUS ELECTRON GAS.
Technical rept. no. 26,
by N. David Mermin. Sep 64, 15p
Contract Nonr2216 11, Proj. NR017 630
Unclassified report

Descriptors: (*Plasma medium, Thermal properties), Electrons, Density, Potential theory, Functional analysis.

A variational property of the ground state energy of an electron gas in an external potential $v(\underline{r})$, derived by Hohenberg and Kohn, is extended to non-zero temperatures. It is first shown that in the grand canonical ensemble at a given temperature and chemical potential, no two $v(\underline{r})$ lead to the same equilibrium density. This fact enables one to define a functional of the density, $F[n(\underline{r})]$, independent of $v(\underline{r})$, such that the quantity $\Omega = \int v(\underline{r})\, n(\underline{r})\, d\underline{r} + F[n(\underline{r})]$ is minimum and equal to the grand potential, when $n(\underline{r})$ is the equilibrium density in the grand ensemble in the presence of $v(\underline{r})$. (Author)

AD-607 721 Div. 25
OTS Prices: HC $1.00/MF $0.50

Air Force Materials Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
RELATIONSHIP OF COMPOSITION TO LATTICE SPACINGS OF SINGLE PHASE ALLOYS.
Rept. for Aug 61-Aug 62,
by Craig S. Hartley. Sep 64, 14p
Proj. 7351, Task 735101
ML TDR64 242
Unclassified report

Descriptors: (*Alloys, Crystal lattices), (*Crystal lattices, Alloys), Mathematical analysis, Phase studies.

The relationship of average interatomic distances to composition in single-phase alloys is discussed in terms of a simplified equation. Sample calculations on existing data show that, within the precision of most composition and lattice parameter data, the probability of an i-j pair can be considered to be those of a random arrangement of atoms and the spacing of an ij pair for alloys of n components can be considered constant over a single phase field. Although this oversimplified picture is at variance with the physical situation as inferred from diffuse x-ray scattering measurements of short-range order and from thermodynamic data, it is felt that an equation of the form presented represents a more generally useful and precise relationship between lattice parameters and compositions of alloys than the generally used linear form of Vegard's Law.

AD-607 723 Div. 25
OTS Prices: HC $3.00/MF $0.75

Redstone Scientific Information Center, Redstone Arsenal, Ala.
EXPERIMENTAL DETERMINATION OF INTERNAL STRESSES IN SOLIDS,
by Augustin Mesnager. 9 Oct 64, 85p
RSIC 299; TT 64 71633
Unclassified report

Trans. of Memorial des Sciences Physiques (France) 1929, v. 10, p. 1-82.

Descriptors: (*Solids, Stresses), (*Stresses, Solids), Elasticity, Test methods, Deformation, Measurements, Mechanical properties, Optical analysis, Mechanics, France.

Contents:
Concepts of Elasticity; Isostatic Lines and Isochromatic Lines; Values of the Principal Tensions; Fundamentals of Strength of Materials; Solutions of Various Problems.

AD-607 732 Div. 25, 8
OTS Prices: HC $3.00/MF $0.75

Space Sciences, Inc., Waltham, Mass.
CATHODE PHENOMENA IN THE LOW PRESSURE MERCURY ARC.
Final rept.,
by S. B. Afshartous, P. Felsenthal, W. E. Knabe, J. M. Proud, and C. G. Smith. Sep 64, 74p
Contract AF30 602 3093, Proj. 5573, Task 557303
RADC TDR64 306
Unclassified report

Descriptors: (*Electric arcs, Cathodes), (*Cathodes, Electric arcs), Discharge tubes, Mercury, Plasma medium, Magnetic fields, Optical properties, Spectroscopy, Mathematical models, Thermionic emission, Electronic switches, Ion engines.

Cathode emission and retrograde motion phenomena were studied for the low pressure anchored mercury arc. Results were obtained from optical measurements of the arc spot size, its optical radiation properties, and its motion about a mercury-wetted anchor in the presence of a strong magnetic field. The shape and spectral emission of the arc column were also examined. Theories are proposed to account for the retrograde motion. A heat balance model of the arc spot is suggested to account for some of the experimental observations, and a modified thermionic emission process is proposed to account for the observed emission current density. (Author)

AD-607 734 Div. 25, 13, 14
OTS Prices: HC $3.00/MF $0.75

Redstone Scientific Information Center, Redstone Arsenal, Ala.
CONTRIBUTION TO THE STUDY OF THE ELASTIC DEFORMATION OF SOLIDS,

The Knight Shift in pure liquid gallium is measured as a function of temperature between 300 and 740K and obeys the empirical relation for change with temperature, Delta K = -(2.95 ± 0.15) x 10 to the minus 7th power (T - 300). The shift varies only slightly with volume according to the expression K(V) = 0.00449 (V/V sub 0) to the minus 0.1 ± 0.1 power at pressures between 1 and 5000 kg/cm. The pressure results disagree with the free electron model, and the intrinsic temperature dependence of K, coupled with the theory of Benedek and Kushida, suggests that the s-electron probability density at the nucleus, P sub F, decreases with negative curvature as a function of volume. The nuclear spin-lattice relaxation time, T sub 1, and spin-spin relaxation time, T sub 2, are measured from 270 to 470K. T sub 1 = T sub 2 at 298K to within 5%. The first results are in good agreement with the theory of Korringa for magnetic relaxation by electrons, when the theory is modified for correlation and exchange as described by Pines. The results are thought to be consistent with a bonded pair or group model of the liquid, whose lifetime is 10 to the minus 13th power sec or less.

AD-607 790 Div. 25
OTS Prices: HC $1.00/MF $0.50

California Univ., Berkeley.
SUBCENTIMETER WAVELENGTHS.
Annual summary rept.,
by M. Tinkham. 1 Oct 64, 2p
Contract Nonr222 58, Proj. NR018 407
Unclassified report

Descriptors: (*Infrared research, Solid state physics), (*Solid state physics, Infrared research), Infrared radiation, Superconductors, Magnetic fields, Magnetic resonance, Superconductivity, Absorption.

Developments on far infrared techniques, applying them to a variety of solidstate physics problems, and also pursuing additional experiments on superconductivity with techniques other than far infrared absorption were undertaken.

AD-607 791 Div. 25, 8
OTS Prices: HC $1.00/MF $0.50

New Mexico State Univ., University Park.
AN EXPERIMENTAL STUDY OF RADIO FREQUENCY PLASMOIDS.
Annual technical rept. no. 1, Sep 63-Sep 64,
by H. B. Williams, August Miller, and J. Robert Trimmier.
Oct 64, 14p
Contract Nonr3531 00
Unclassified report

Descriptors: (*Plasma medium, Radiofrequency), Ion beams, Silver, Probes (Electromagnetic), Electric discharges, Spectroscopy, Thermodynamics.

The experimental program consists of three distinct approaches. The first is to probe the plasmoids with a silver ion beam, that is, the measurement of beam deflection as a function of position in order to determine the average charge number density of the plasmoid. The unexpected disappearance of the ion beam within the plasmoid has, however, altered the problem. The second approach is to utilize metallic Langmuir probes and the double probe in order to ellicit much the same information as the ion beam probe. The effort here is directed toward the establishment of probe characteristics within this type of discharge. A spectroscopic investigation of the plasmoids is also being conducted in order to obtain a kinetic temperature profile of the discharge region. (Author)

AD-607 805 Div. 25
OTS Prices: HC $2.00/MF $0.50

Brandeis Univ., Waltham, Mass.
CHARGE DEPENDENCE IN IONIC SOLVATION.
Technical rept. no. 12,
by Sidney Golden and Charles Guttman. 15 Oct 64, 34p
Contract Nonr1677 01, Proj. NR051 362
Unclassified report

Descriptors: (*Solvents, Quantum mechanics), (*Quantum mechanics, Solvents), Ions, Solvents, Hamiltonian, Energy, Thermodynamics, Statistical analysis, Molecules, Mathematical models, Ionization.

Systems consisting of a single electrically neutral or ionic species in interaction with a large number of solvent molecules are treated in general quantum statistical mechanical terms. Such systems are assumed to have Hamiltonians, for each electronic state, which exhibit a dependence upon charge not exceeding quadratic. Changes in the Helmholtz free-energy, energy and entropy functions are determined formally for the process of ionic solvation due to Born. On the basis of a general argument that an electrically neutral species acquires a non-zero potential upon solvation, the changes in the cited thermodynamic functions are shown to be capable of taking on positive values. This behavior is in direct contrast with expectations from the Born expression for such changes. Semi-empirical treatment of data available for solvation free-energies of aqueous ions permits an estimate, of one volt, to be made of this potential. A possible experimental test of this result is described. (Author)

AD-607 819 Div. 25
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
RADIATION BY PLASMA OSCILLATIONS IN A BOUNDED PLASMA IN A MAGNETIC FIELD,
by H. W. Wyld, Jr. 23 Oct 59, 30p PRL-9-23
PB 147 000
Unclassified report

Descriptors: (*Plasma oscillations, Electromagnetic waves), (*Electromagnetic waves, Plasma oscillations), Magnetic fields, Surface properties, Plasma physics, Partial differential equations, Integrals, Refraction, Electromagnetic wave reflections, Wave transmission, Synchrotrons, Cyclotron resonance phenomena.

The radiation is calculated by a thermal distribution of plasma oscillations in a bounded plasma in a magnetic field is calculated. The calculation is performed in two ways leading to the same result: (1) a Fresnel formula for the ratio of the intensity of the electromagnetic wave transmitted through the plasma boundary to the intensity of an incident plasma oscillation is derived; (2) the decaying modes, satisfying a radiation condition at infinity, of a bounded plasma in a magnetic field are found. The results are compared with the synchrotron radiation by a plasma in a magnetic field. It is found that for a thermal distribution of plasma oscillations the radiation due to plasma oscillations is small compared to the synchrotron radiation. (Author)

AD-607 846 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
MAGNETOHYDRODYNAMICS IN A FIELD OF INTERMEDIATE STRENGTH,
by H. W. Wyld, Jr. 30 Sep 58, 19p
STL/GM-TR-0165-00486
Contract AF04 647 165 Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Magnetohydrodynamics, Numerical analysis), Magnetic fields, Electrostatics, Plasma medium, Electrons, Ions, Plasma oscillations.

A magnetohydrodynamic approximation is developed for magnetic fields strong enough so that the Larmor radii and periods of the electrons are negligible while those of the ions are not. Electrons are then bound to the field lines while the ions are chiefly influenced by electrostatic forces. This formalism is applied to the particular problem of stationary, large amplitude waves and solutions are given for the case where the Alfven velocity is small compared to light velocity. (Author)

AD-607 852 Div. 25
OTS Prices: HC $3.00/MF $0.75

Stanford Electronics Labs., Stanford Univ., Calif.
TUNING OF CW LASERS OVER ANGSTROM BANDWIDTHS: SOME POSSIBLE APPROACHES.
Technical rept. for Jun 63-Jun 64,
by R. J. Morris. Aug 64, 62p
SEL-64-092, SEL-TR-0576-6
Contract AF33 657 11144, Proj. 4036, Task 403602
AL TDR64 227

Unclassified report

Descriptors: (*Lasers, Tuned amplifiers), (*Tuned amplifiers, Lasers), Tuning devices, Signals, Frequency shift, Diffraction, Sound, Crystals, Magnetic fields, Doppler effect, Temperature, Particle beams, Frequency modulation, Microwave frequency.

This report is an investigation of several approaches to the problem of obtaining cw coherent optical signals whose wavelength can be scanned in a controlled fashion over a range of approximately 1 A or more. The methods discussed include the following internal tuning methods: Zeeman tuning; diffraction from acoustic waves; crystal-strain tuning; thermal tuning; tunable mode selection in wide lines; and Doppler-shift tuning using a beam of accelerated particles. The last method listed is believed to be a novel scheme for laser tuning. Frequency modulation using microwave frequencies and large modulation indices is also discussed as an external tuning method. Of all the approaches, it is probably the one that will provide the simplest and most effective solution. (Author)

AD-607 856 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE THEORY OF THE ATOMIZATION OF SINGLE CRYSTALS,
by Y. V. Martynenko. 20 Oct 64, 14p
FTD TT64 949; TT 64 71639

Unclassified report

Unedited rough draft trans. of Fizika Tverdogo Tela (USSR) 1964, v. 6, no. 7, p. 2003-2009.

Descriptors: (*Single crystals, Atomization), (*Atomization, Single crystals), Ions, Atomic properties, Differential equations, Atomic energy levels, Spheres, Anisotropy, Transport properties, Copper, Argon, Crystal lattices, Energy.

A formula has been obtained for the coefficient of atomization (spraying) of single crystals which does not have empirical coefficients. It was assumed that the potential of the interacting ions with the atoms of the target U = A/r squared. It is shown that with such a potential there should be screening of the lower atomic layers by the ones lying above, such screening being necessary for explaining the dependence of the coefficient of atomization on the angle of incidence of the ions. There is a computation of the average energy lost by the ion in each atomic layer. For obtaining the numerical value of the coefficient of the atomization it was assumed that the transmission of energy to the surface occurs with the aid of 'focusons.' The 'g. ts. k.' are discussed and there have been taken into account only the 'focusons' in the direction (110). The computed curves of the dependence of the coefficient of atomization on the angles of incidence of the ions are compared with the experimental ones. (Author)

AD-607 857 Div. 25, 32
OTS Prices: HC $3.00/MF $0.75

Naval Academy, Annapolis, Md.
TRANSIENTS IN WOOD-WIND AND BRASS MUSICAL INSTRUMENTS.
Research rept.
by Herbert M. Neustadt. Oct 63, 73p
NAVAL ACAD 84

Unclassified report

Descriptors: (*Music, Sound pitch), (*Sound pitch, Control), Wood, Wind, Brass, Electronics, Sound generators, Pitch discrimination, Acoustics.

Development work on a new electronic musical instrument revealed that the sound output of an electronic audio oscillator includes a characteristic click sound when the oscillator makes an abrupt frequency change. The click sound is loud when the frequency change is as large as an octave, and barely perceptible when the change is as small as a semitone. An explanation is given for the click sound in Fourier terms. The question naturally arises: How do the traditional wind instruments avoid this click. The answer is surprising: They must avoid it by means of an amplitude interruption automatically synchronized with the frequency change. When they do not make this amplitude interruption, the frequency change is accompanied by a click or knock sound. When the amplitude interruption occurs, it is not perceived by the ear as an interruption. The reader can verify this last statement by playing a tape recording obtainable from the author. (Author)

AD-607 862 Div. 25
OTS Prices: HC $3.00/MF $0.75

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
PROPERTIES OF ARGON-FREE AIR,
by F. Blackwell, D. L. Bussard, D. Combelic, E. P. Palmer, and J. M. Richardson. 1 Oct 56, 84p
GM-51-88, GM-TR-76

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Air, Thermodynamic properties), Physical properties, Argon, Nitrogen, Oxygen.

Gas properties were computed from tables of thermodynamic properties furnished by the National Bureau of Standards. The NBS tables give values of Z=PV/RT, E/RT, H/RTM , S/R, and Pas functions of log (rho/rho sub O) and T. The tabulated values are for one mole of a mixture of nitrogen and oxygen which has a low-temperature composition of 0.78847N2 and 0.21153 02.

AD-607 880 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOME NONLINEAR EFFECTS IN FERROELECTRICS,
by L. V. Lyagin and Ya. I. Geivashovich. 9 Sep 64, 14p
FTD TT64 453; TT 64 71643
Unclassified report

Unedited rough draft trans. of Gosudarstvennyi Pedagogicheskii Institut, Smolensk. Uchenye Zapiski (USSR) 1962, v. 10, p. 94-102.

Descriptors: (*Ferroelectric crystals, Phase studies), (*Phase studies, Ferroelectric crystals), Nonlinear systems, Ferroelectricity, Thermodynamics, Hysteresis, Dielectric properties, Mathematical analysis, Physical properties, USSR.

The nonlinear effects connected with the physical changes of ferroelectric crystals are considered. Several theories are discussed concerning domain structure and phase transitions of ferroelectrics. Mathematical explainations of theories are developed.

AD-607 900 Div. 25, 8, 15
OTS Prices: HC $4.00/MF $0.75

Air Force Cambridge Research Labs., Bedford, Mass.
A DETERMINATION OF THE ELECTROMAGNETIC SCATTERING FROM A CAVITY-BACKED PLANE SURFACE.
Physical Sciences Research papers,
by John K. Schindler and Floyd V. Schultz. Sep 64, 104p
AFCRL 64 784; PSRP 50
Unclassified report

Prepared in cooperation with Purdue Research Foundation, Lafayette, Ind., Contract AF19 604 4051.

Descriptors: (*Electromagnetic waves, Scattering), Microwaves, Electric fields, Surfaces, Polarization, Excitation, Mathematical analysis, Equations.

A determination is made of the electromagnetic scattering from an infinite plane surface backed by an infinitely long rectangular cavity. The cavity is coupled through the plane surface by a narrow, infinitely long aperture running parallel to the axis of the cavity. The structure is excited externally by a plane wave of arbitrary polarization and arbitrary angles of incidence. In the formulation given, a pair of singular integral equations governs the behavior of the tangential components of the electric field in the aperture (the aperture fields). The integral equations are solved using a standard perturbation technique under the assumption of a small aperture width in wavelengths. The fields scattered by the structure consist of the superposition of a field specularly reflected from the plane surface and a field reradiated by the induced aperture fields. The spatial distribution of aperture fields is numerically calculated for various cavity dimensions. A simple, approximate technique is outlined for obtaining the component of the aperture field perpendicular to the edge. The results of this technique are briefly compared with the more accurate results obtained from the integral equations. (Author)

AD-607 901 Div. 25
OTS Prices: HC $3.00/MF $0.75

Air Force Cambridge Research Labs., Bedford, Mass.
RADIO FREQUENCY PROPAGATION THROUGH AN INHOMOGENEOUS, MAGNETOACTIVE, NONLINEAR PLASMA MEDIUM.
Physical Sciences Research Papers,
by R. J. Papa. Sep 64, 63p
AFCRL 64 756; AFCRL PSRP49
Unclassified report

Descriptors: (*Plasma medium, Wave transmission), (*Radio waves, Propagation), Electrons, Distribution, Statistical functions, Partial differential equations, Electromagnetic waves, Radiofrequency, Polarization, Tensor analysis, Integration.

The Boltzmann equation corresponding to an electromagnetic wave propagating in a magnetoactive plasma is solved by making a spherical harmonic expansion of the electron distribution function. The problem of a plane, monochromatic wave normally incident upon a nonlinear, anisotropic, inhomogeneous plasma slab is also considered.

AD-607 903 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THE PLASMA JET,
by J. Lominadze. 21 Oct 64, 15p
FTD TT64 35; TT 64 71646
Unclassified report

Edited trans. of Metaniereba da Tekhnika (USSR) 1960, no. 3, p. 14-18.

Descriptors: (*Plasma jets, Reviews), Shock waves, Gas ionization, Electric arcs, Hypersonic wind tunnels, USSR.

A popularized review of some fundamental aspects of plasma jets.

AD-607 917 Div. 25
OTS Prices: HC $3.00/MF $0.75

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP.
Quarterly progress rept. no. 54.
15 Oct 64, 94p
Contracts Nonr1841 34; AF19 628 356
Unclassified report

Descriptors: (*Solid state physics, Scientific research), Atomic structure, Crystals, Crystal structure, Potassium compounds, Chlorides, Brillouin zones, Valence, Atomic energy levels, Silver compounds, Bromides, Crystal lattices, Vibration, Impurities, Alkali metal compounds, Halides, Thermal conductivity, Perturbation theory, Special functions (Mathemical), Numerical analysis.

Contents:
Survey
Empirical Atomic Radii and Self-Consistent Fields.
Validity of the 'Muffin Tin' Approximation to the KCl Crystal Potential.
Band Structure of Silver Chloride and Silver Bromide.
Lattice Vibration Effects Due to Impurities in An Alkali Halide.

AD-607 935 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
INSTABILITY OF A PLASMA COLUMN CONFINED BY STANDING ELECTROMAGNETIC WAVES,
by Erich S. Weibel. 1958 15p PRL-8-18
Unclassified report

Descriptors: (*Plasma medium, Stability), (*Electromagnetic waves, Plasma physics), Pressure, Plasma oscillations, Electromagnetic fields, Waveguides, Mathematical analysis.

A discussion of the confinement of a plasma column by standing electromagnetic waves is given in mathematical terms.

AD-607 941 Div. 25
OTS Prices: HC $3.00/MF $0.75

Minnesota Univ., Minneapolis.
A STUDY OF THE TRANSIENT BEHAVIOR OF PLASMAS.
Final rept. for Apr 62-Apr 64,
by Richard W. Carlson and Hendrik J. Oskam. Oct 64, 94p
Contract AF33 657 8685, Proj. 4152, Task 415202
AL TDR64 248

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Plasma sheath, Dynamics), (*Probes (Electromagnetic), Plasma sheath), Capacitance, Measurement, Theory, Space charges, Ions, Electrons, Transients.

The report describes results obtained during studies of the dynamic properties of a plasma-boundary sheath. The main effort was directed towards the calculation and measurement of the capacitance of a plasma sheath. The calculations predicted that the capacitance value of a plasma sheath surrounding a cylindrical probe depends only weakly on the ratio of the probe radius and sheath radius. Measurements confirmed this prediction and, moreover, yielded values in agreement with theory. The method of calculating the probe-sheath capacitance is compared with those reported by other investigators. (Author)

AD-607 942 Div. 25, 4
OTS Prices: HC $3.00/MF $0.75

Michigan Univ., Ann Arbor. Coll. of Literature, Science, and the Arts.
VIBRATION-ROTATION SPECTRUM OF MATRIX ISOLATED AMMONIA.
Technical rept. no. 3,
by Robert E. Meredith. Nov 63, 76p ORA-03640-3-T
Contract AF19 604 6125, Projs. 8603, 03640,
Task 860301
AFCRL 64 459

Unclassified report

Doctoral thesis.

Descriptors: (*Ammonia, Spectra (Infrared)), (*Free radicals, Embedding substances), Ammonium compounds, Chemical bonds, Vibration, Rotation, Band spectrum, Atomic energy levels, Solidified gases, Argon, Krypton, Xenon.

An investigation of NH3 and ND3 isolated in inert gas matrices at 4.2K was made in the regions of the Nu-1, -2, and -3 fundamentals, and in the vicinity of the overtone 2 Nu-4. The spectra were scanned with spectral slit widths ranging from .1 to .5/cm, and it was found that this resolution was adequate to insure that all the observed line widths and shapes were free from instrumental broadening. The Nu-2 fundamental was interpreted in terms of a free rotation model, with the line spacings and inversion splitting having values very close to those observed for gas phase molecules. The interpretation of the Nu-1, Nu-3 and 2 Nu-4 spectra was much more difficult, since these bands were too weak to permit observation of the 'E' type spectra, and since the inversion doubling of the levels involved cannot be observed due to the broadness of the lines. It was possible, however, to determine the dependence of the lines on the ratio of inert gas atoms to ammonia molecules, and to assign the transitions involved as arising from either single isolated molecules or from ammonia complexes caused by incomplete isolation. Argon, krypton, and xenon were successively used as matrices, and spectra obtained in each case differed only in the vibrational frequencies were shifted to longer wavelengths as the matrix was varied. (Author)

AD-607 957 Div. 25
OTS Prices: HC $2.00/MF $0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
REPRESENTATIVE CURVES OF THE LAWS OF LONGITUDINAL AND TRANSVERSE IMPACT ON A PRISMATIC BAR,
by Saint-Venant and M. Flamant. 9 Oct 64, 38p
RSIC 300; TT 64 71656

Unclassified report

Trans. of Ecole Polytechnique, Paris. Journal (France) 1889, v. 59, p. 97-128.

Descriptors: (*Graphics, Elasticity), (*Prismatic bodies, Rods), (*Impact shock, Rods), Series, Equations, Moments of inertia, Rectangular bodies, France.

The object of the present work was to publish the curves set up about 25 years ago, by Saint-Venant, for representing graphically the laws of longitudinal and transverse impact on a prismatic bar struck at its end or its center by a body having a mass comparable to its own. These curves were drawn in 1873, but the author, distracted by other work, had never completed them by adding the letters, marks and legends necessary for their understanding. Moreover, he had been most scrupulous in regard to their accuracy: the ordinates of these curves are expressed, as will be seen, by means of convergent series of which he had only taken the first terms, and he was most concerned lest the neglected terms, even though very small, should in their ensemble modify the form of the curves which he had deduced from the first terms. This scruple was especially accentuated since the publication in Comptes rendus of the representative curves of longitudinal impact according to the solution in finite terms given by Boussinesq. These curves, which are exact, seemed to differ considerably from those deduced from the first terms of the series, although the difference was, basically, more apparent than real.

AD-607 960 Div. 25
OTS Prices: HC $3.00/MF $0.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON THE USE OF REFRACTIVE INDEX DIAGRAMS FOR SOURCE-EXCITED ANISOTROPIC REGIONS.
Research rept.,
by L. B. Felsen. 10 Sep 64, 55p PIBMRI-1239-64
Contract AF19 628 2357, Proj. 5635, Task 563501
AFCRL 64 799

Unclassified report

Descriptors: (*Electromagnetic waves, Propagation), (*Refractive index, Electromagnetic waves), Anisotropy, Cerenkov radiation, Energy, Sources, Wave transmission, Vector analysis, Frequency, Polarization.

The use of refractive index diagrams in the study of

26. Production and Management

AD-607 469 Div. 26, 15
OTS Prices: HC $2.00/MF $0.50

Northwestern Technological Inst., Evanston, Ill.
EFFECTIVE CONTROL THROUGH COHERENT DECENTRALIZATION WITH PREEMPTIVE GOALS,
by A. Charnes, R. W. Clower, and K. Kortanek.
Aug 64, 45p ONR-RM-88
Contract Nonr1228 10, Proj. NR047 021
Unclassified report

Prepared in cooperation Chicago Univ., Ill.

Descriptors: (*Management control systems, Operations research), (*Operations research, Management control systems), Optimization, Management planning, Decision theory, Economics, Mathematical analysis, Linear programming, Mathematical models, Theory.

This paper shows that control through decentralization can be affected in general if additional information in the form of preemptive goals is delegated to individual units as well as prices. It is shown that the procedure is a robust one and results in small errors in profit. The technique of preemptive goals providing further control advantages in an economy where structural change is taking place over time as reflected by changing technological coefficient matrices of individual units is indicated.

AD-607 557 Div. 26
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A FACILITY FOR HORIZONTAL VIBRATION TESTING WITH ELECTROMAGNETIC EXCITERS.
Preliminary rept.,
by F. P. Klein. 13 May 58, 18p STL/GM-TN-0165-00141
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Test facilities, Vibration), (*Vibration, Test equipment), (*Vibrators (Mechanical), Test equipment), Design, Containers, Films, Oils, Transducers, Damping, Vibrators (Electrical), Accelerometers, Specifications.

AD-607 683 Div. 26, 17
OTS Prices: HC $6.00/MF $1.25

Metals and Controls, Inc., Attleboro, Mass.
DEVELOPMENT OF OPTIMUM PROCESSING PARAMETERS FOR REFRACTORY METAL FOIL.
Technical documentary rept. no. 2, 1 May 63-31 Mar 64,
by J. J. Buchinski, G. P. Trost, and P. A. Dion.
Jun 64, 236p
Contract AF33 657 9384, Proj. 651G
ASD TDR63 829 P2
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Foils, Refractory metal alloys), (*Refractory metal alloys, Foils), Niobium alloys, Molybdenum alloys, Vanadium alloys, Zirconium alloys, Tungsten alloys, Carbon alloys, Hafnium alloys, Heat treatment, Rolling (Metallurgy), Processing, Manufacturing methods, Fracture (Mechanics), Recrystallization, Strain (Mechanics), Hardness.

Approximately 480 pounds of high quality 2, 6, and 12-mil B-66, Cb-752, D-43 and T-111 alloy strip were produced and extensively evaluated. Recommendations for processing and quality assurance procedures for the production of high quality refractory metal foil were prepared. Particular consideration was given to annealing, handling practices, and economics. Materials specifications for reroll stock and finished foil were prepared. Rollability studies of program alloys were conducted on an instrumented laboratory rolling mill. Flatness correction for 6-mil foil through the use of the roller-stretching principle was demonstrated. Work hardening and recyrstallization characteristics of the foil materials were determined. A special study of the B-66 cracking problem was conducted. (Author)

AD-607 800 Div. 26, 32
OTS Prices: HC $1.00/MF $0.50

California Univ., Los Angeles.
THE OPTIMAL MANAGEMENT POLICY OF AN INSURANCE COMPANY,
by Karl Borch. Sep 64, 25p WMSI-WP-54
Proj. NR047 041
Unclassified report

Supported in part by a grant from the Ford Foundation. Prepared for presentation at a meeting of the Casualty Actuarial Society in New York, Nov 64.

Descriptors: (*Management planning, Money), (*Probability, Management planning), (*Economics, Probability), Optimization, Mathematical models, Difference equations, Equations, Functions, Mathematical analysis, Operations research.

This paper discusses some of the decision problems which occur in insurance companies. It indicates how these problems may be solved by combining the familiar ideas of actuarial mathematics with those of modern theories of scientific management. In general, management has some rules as to how these decisions shall be made. These rules are referred to as the management policy of the company.

AD-607 801 Div. 26
OTS Prices: HC $1.00/MF $0.50

California Univ., Los Angeles.
INVENTORY CONTROL OF A MULTIPRODUCT SYSTEM WITH A LIMITED PRODUCTION RESOURCE,
by Richard V. Evans. Aug 64, 22p
WMSI-WP-49, MSRP-RR-89
Contract Nonr233 73
Unclassified report

Supported in part by a grant from the Ford Foundation.

Descriptors: (*Inventory control, Management engineering), (*Management engineering, Industrial production), (*Management control systems, Mathematical models), Operations research, Dynamic programming, Costs, Equations.

Optimal control of the production of several products subject to restricted production resources is considered. Linear production, holding and penalty costs are assumed although this is crucial only for production costs. Excess demand results in lost sales. A single point plays an important role in the definition of the optimal policy. (Author)

plane wave propagation in unbounded and layered anisotropic media is reviewed and then extended to account for certain aspects of the radiation from confined source distributions. Such items as the radiation condition, saddle point location, focusing effects, lateral ray trajectories, Cerenkov radiation, and others are interpreted via the refractive index plots. While some of this material is available in various technical publications, the aim here is at a more unified presentation. (Author)

AD-607 961 Div. 25
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
SHOCK SPECTRUM WITH CONSTANT FRICTION,
by W. T. Thomson. 1 Aug 60, 8p
STL/TR-60-0000-09241, STL/EM-10-13
Unclassified report

Descriptors: (*Shock (Mechanics), Friction), (*Friction, Shock (Mechanics)), Force (Mechanics), Motion, Equations, Integral transforms, Numerical analysis.

The problem considered concerns a mass M which is shock isolated by a linear spring and a friction device of constant force. The support is subjected to a triangular velocity pulse. It was desired to find the maximum force on M and its relative displacement.

AD-607 963 Div. 25
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
DYNAMIC STABILIZATION OF A PLASMA COLUMN,
by Erich S. Weibel. 15 Aug 60, 64p
STL/TR-60-0000-GR269
PB 152 113
Unclassified report

Descriptors: (*Plasma medium, Stabilization), Plasma oscillations, Magnetic fields, Perturbation theory, Fourier analysis, Deformation, Integral equations, Magnetic pinch.

A cylindrical plasma column is confined by a magnetic field whose z-component is constant while the phi-component oscillates sinusoidally. The skin depth is assumed to be negligible so that the boundary can be considered as sharp and the interior of the plasma as field free. The plasma itself is treated as an assembly of noncolliding particles which are specularly reflected at the plasma surface. The oscillating pressure of the applied field causes the plasma surface to execute a small periodic motion independent of phi and z. All other components of the displacement decay in time. Thus, the plasma is positively stable against all deformations. For magnetostatic confinement this treatment yields the usual instabilities, but in contrast to earlier work, the growth rates are bounded as the deformation wave length approaches zero. This appears to be in better agreement with experiment. (Author)

AD-607 964 Div. 25, 9
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
CONCERNING EQUATIONS OF ELASTIC OSCILLATIONS OF THIN-WALLED BARS FILLED WITH LIQUID HAVING A FREE SURFACE,
by B. I. Rabinovich. Jun 60, 14p
STL-T-Ru-19, STL-60-5111-59
TT 64 71660
Unclassified report
Trans. of Akademiya Nauk SSSR. Izvestiya. Mekhanika Mashinostroenie, 1959, no. 4, p. 63-68.

Descriptors: (*Pipes, Oscillation), (*Oscillation, Equations), Elasticity, Deformation, Fluid flow, Liquids, Rods, Loading (Mechanics), Differential equations, Mathematical analysis, Surfaces, USSR.

The equations derived concern elastic oscillations of a thin-walled bar partially filled with liquid. The axis of this bar coincides with the direction of the field of external mass forces. This field can, generally speaking, be nonstationary, but is assumed to be potential in all cases. (Author)

AD-607 969 Div. 25
OTS Prices: HC $1.00/MF $0.50

Navy Electronics Lab., San Diego, Calif.
A VERSATILE EIGHT-METER GAS LASER SYSTEM.
Research rept. for Dec 62-Mar 64,
by V. N. Smiley and A. L. Lewis. 28 Sep 64, 25p
Proj. SF001 01 01, Tasks 2869, NEL L7 1
NEL 1242
Unclassified report

Descriptors: (*Lasers, Design), Oscillators, Amplifiers, Prisms(Optics), Mirrors, Alignment, Spectra (Infrared), Polarization, Helium, Neon, Vacuum systems.

An 8-meter-long, versatile gas laser and associated equipment were designed and constructed, employing three methods of excitation (60-c/s ac, dc, and rf) and a Brewster-angle prism method of intracavity wavelength selection. The high gain resulting from the extreme length of the laser facilitated the finding of previously unreported laser lines in the infrared. A novel method of facilitating the alignment of mirrors, making use of the 3.39-micron He-Ne line, was utilized. Calculations of reflectance for light polarized parallel to the plane on incidence for small deviations from the Brewster angle are give for an air-quartz interface. (Author)

AD-607 990 Div. 25, 13
OTS Prices: HC $2.00/MF $0.50

Dynatech Corp., Cambridge, Mass.
THE CIRCULAR TORUS MEMBRANE UNDER INTERNAL PRESSURE,
by J. Lyell Sanders, Jr. and Atis A. Liepins.
May 62, 39p
Contract AF49 638 1096
AFOSR 2867
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Membranes, Stresses), Vibration, Rotation, Pressure, Nonlinear systems, Mathematical analysis, Theory, Frequency.

Expressions for membrane stress resultants are derived from a nonlinear membrane theory which eliminates the undesirable infinities in one of the two displacements and the rotation of the normal to the middle surface as predicted by linear membrane theory. The advantages of these results are that they remain meaningful for very small pressures and that no further manipulation is necessary to obtain stress resultants for all pressures and circular torus configurations. A variational equation is derived for the determination of the modes and natural frequencies of vibration of a torus whose walls have no bending stiffness and which are prestressed by internal pressure. (Author)

27. Propulsion Systems

AD-607 600 Div. 27, 9, 10
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
ONE DIMENSIONAL FLOW OF A GAS PARTICLE SYSTEM.
Revised ed.,
by J. R. Kliegel. 28 Aug 59, 30p STL/TR-59-0000-00746
Unclassified report

Revision of 8 Jul 59 edition.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Exhaust nozzles, Gas flow), (*Gas flow, Exhaust nozzles), One-dimensional flow, Exhaust gases, Particles, Mixtures, Fluid flow, Equations, Fluid mechanics.

A family of solutions to the equations governing the one dimensional flow of a gas-particle system are presented. The basic assumptions upon which the theory is based are that the particles do not interact (distance between particles large compared to their size) and that the particles are spheres and are always in Stokes flow regime (small particle lags). It is shown that this family of solutions corresponds to flow in a nozzle in which the axial velocity gradient is a constant. As this condition is approximately realized in the throat region of most nozzles, it is believed that the theory has general validity near the nozzle throat. The design of a nozzle for use with a gas-particle exhaust system is also discussed.

AD-607 630 Div. 27, 17
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
PRESSURE VESSEL DESIGN CRITERIA.
Semiannual rept. for 1 Jan-30 Jun 59,
by D. P. Fitzgibbon. 30 Jun 59, 60p
STL/TR-59-0000-00714
Contract AF04 647 309
Unclassified report

Descriptors: (*Pressure vessels, Design), (*Rocket cases, Design), (*Steel, Mechanical properties), Heat treatment, Performance (Engineering), Tensile properties, Deformation, Stresses, Hardness, Failure (Mechanics), Experimental data, Tests, Ductility.

The purpose of the work being performed in this program is to provide experimental data to assist in establishing material selection, and design and fabrication criteria for reliable, highly efficient pressure vessels. Tests have been concluded in which material performance in tensile and bend tests was examined. Tests are under way to determine material performance in small-scale pressure vessels. Anisotropic effects have been observed in biaxial stress fields for AISI 4340 steel which cannot be detected when the material is subjected to a uniaxial stress field. Characteristics of materials in uniaxial and biaxial stress states and correlation between tensile, bend, hardness, and pressure vessel tests will be reported upon completion of this work. (Author)

AD-607 895 Div. 27
OTS Prices: HC $2.00/MF $0.50

Naval Postgraduate School, Monterey, Calif.
GAS TURBINE REGENERATOR FOULING INVESTIGATION.
Quarterly progress rept. no. 1,
by H. L. Kohler and J. A. Miller. 15 Oct 64, 35p
NPS,M TR21; NPS,M 64T 8
Unclassified report

Descriptors: (*Gas turbine regenerators, Fouling), (*Fouling, Gas turbine regenerators), Thermal conductivity, Pressure, Heat exchangers, Performance (Engineering), Surface temperatures, Exhaust gases, Propulsion.

A report on the progress of an experimental investigation of fouling effects in compact gas turbine regenerator matrices is presented. Fouling effects on heat transfer rates and pressure drop characteristics for a number of matrix geometries and two exhaust gas temperatures are presented. Preliminary results indicate gas side surface temperature and gas composition as the primary parameters with geometric effects occupying a lesser role. The effect of fouling on pressure drop characteristics is found to be more pronounced than the effect on heat transfer. Plans for continuation of the investigation are presented. (Author)

AD-607 975 Div. 27
OTS Prices: HC $2.00/MF $0.50

Rocket Propulsion Lab., Air Force Systems Command, Edwards, Calif.
DISK PUMP FEASIBILITY INVESTIGATION,
by R. O. Byrne. 1 Jul 64, 44p
Proj. 3058
RPL TDR64 119
Unclassified report

Descriptors: (*Turbopumps, Liquid rocket propellants), (*Rocket propulsion, Turbopumps), Viscosity, Design, Feasibility studies, Performance (Engineering), Rocket motors, Equations.

The disk pump was investigated at the Air Force Rocket Propulsion Laboratory (AFRPL) to determine the feasibility of using a novel viscous pumping system as an inducer and/or mainstage pump for liquid rocket applications. This investigation consisted of the analysis, design, and test of a disk pump primarily for application as an inducer. The disk pump differs drastically from conventional pumps because of the following major factors: (1) The pumping action is a function of the viscous properties of the pumped fluid. (2) The pump does not require the conventional pump lifting forces. (3) The pump inlet relative velocity is equal only to the through flow velocity between the disks. Therefore, there is good indication that the disk pump will operate stably with excellent suction pump performance characteristics. The maximum suction specific speed reached was 55,400 in 70F water, with no apparent head deterioration. The representative maximum suction specific speed at a 3% head drop was never reached. The pump demonstrated unusual stability characteristics throughout all tests even at ultra low NPSH values of 4.7 ft. (Author)

AD-607 979 Div. 27, 9
OTS Prices: HC $3.00/MF $0.75

Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
RAMJET TECHNOLOGY, SECTION ON FLOW PROCESSES AND ENGINE PERFORMANCE. CHAPTER 2, BASIC ADIABATIC THEORY,
by E. A. Bunt. Oct 64, 92p TG-610-2
Contract NOw62 0604c
Unclassified report

AD-607 806 Div. 26, 32
OTS Prices: HC $1.00/MF $0.50

California Univ., Los Angeles.
TOWARD A THEORY OF OPTIMUM FINANCING MIX,
by Arnold Reisman, J. Fred Weston, and Elwood S. Buffa.
Aug 64, 18p WMSI-WP-50
Unclassified report

Also supported by a grant from the Ford Foundation.

Descriptors: (*Management engineering, Economics), (*Economics, Mathematical models), Money, Equations, Stochastic processes, Computers, Costs, Budgets.

A general model for the financing mix problem is developed which involves the simultaneous solution of a system of independent equations. The functions developed are general in nature so that for specific applications they may be deterministic or stochastic, continuous or discrete, functional or numerical. A generalized computer routine is currently being developed to facilitate the computational aspects of application. Since the model is general in nature, a classification scheme is also developed which makes it possible to see the relationship of previous financing mix models to the general model developed here. (Author)

AD-607 842 Div. 26
OTS Prices: HC $2.00/MF $0.50

General Electric Co., Utica, N. Y.
PROGRESS IN RESOURCES PLANNING THROUGH PERT.
Technical Information Series,
by W. Morehouse.. 15 Jun 60, 50p R60EML46
Unclassified report

Descriptors: (*Management control systems, Simulation), (*Management planning, Management control systems), Management engineering, Manpower studies, Time studies, Industrial production, Quality control, Costs, Computers, Networks, Probability, Synthesis, Analysis, Reports.

Techniques and results developed during one year of implementation of PERT as a planning tool in Engineering R and D and Manufacturing are described. PERT has been utilized for technical risk evaluation, alternative simulation and capacity analysis. Extensions of the logic into the fields of manpower, facility, and cost forecasting lead to a comprehensive business planning tool. Conclusions: Integration among engineering, production and quality control has been simplified. The full utilization of the simple logic of PERT gives management a practical and powerful tool for the planning, monitoring and prediction of complex business operations. (Author)

AD-607 856 Div. 26, 8, 30
OTS Prices: HC $3.00/MF $0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AUTOMATION TODAY AND TOMORROW: COLLECTION OF ARTICLES.
20 Oct 64, 62p
FTD MT64 188; TT 64 71640
Unclassified report

Avtomatizatsiya Segodnya i Zavtra, Edited machine trans. of Novoe v Zhizni, Nauke, Tekhnike. Seriya 4: Tekhnika (USSR) 1963, no. 11, p. 1-40.

Descriptors: (*Automation, Reports), Industrial production, Communism, Cybernetics, Feedback, Teaching machines, Education, Economics, Theory, Microminiaturization (Electronics), Physiology, USSR, Electronics.

Contents: Arming personnel with advanced science; main trends in the development of automation; some problems of radio electronics; for creative collaboration of engineers and biologists; the theoretical bases of automation; electronic technology at the service of automation; and mathematical problems of the organization of production.

AD-607 902 Div. 26
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
GOST 2246-60 STEEL WELDING WIRE.
19 Oct 64, 15p
FTD TT64 378; TT 64 71645
Unclassified report

Provoloka Stal'naya Svarochnaya, unedited rough draft trans. of Russian State Standard GOST 2246-60, gr. V05, approved 4 Mar 60, submitted 1 Jul 60, Moscow, 1961, 8p.

Descriptors: (*Welding rods, Standards), (*Steel, Welding rods), (*Standards, Welding rods), Specifications, Chemical analysis, Quality control, Wire, Packaging, Cold working, Drawing (Machine processing), USSR.

Russian state standards extended to cold-drawn steel wire for welding and beading.

AD-607 930 Div. 26, 25
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
TABLES AND CHARTS OF THE SHOCK RESPONSE OF NONLINEAR SYSTEMS (II),
by R. N. Schreiner and Y. C. Fung. Jun 61, 74p
STL/EM-11-10
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Springs, Shock (Mechanics), (*Shock (Mechanics), Springs), Impact shock, Nonlinear systems, Vibration isolators, Loading (Mechanics), Mechanical properties, Tables, Graphics.

This paper presents tables and charts of loading ratio of the shock response of several nonlinear systems, and the composite C sub 1 - C sub 2 - C sub 3 charts. These data constitute a concise presentation of the response characteristics of a nonlinear system to shock loading, and are useful in many applications. The present report is concerned with two types of springs: (1) elastic, softening, cubic spring, (2) bilinear springs, which includes a spring with perfectly plastic yielding characteristics as a special case. The bulk of the material is related to a half-sine pulse. However, the results for quarter-cosine pulse, (one with zero rise-time) a double-square pulse (one with zero area or total impulse), and an impulsive loading with constant decay (a delta function at tau = 0 followed by a constant deceleration, with zero total area, i.e., a triangular 'velocity pulse'), are also presented. (Author)

28. Psychology and Human Engineering

AD-607 443 Div. 28, 8, 18, 23
OTS Prices: HC $3.00/MF $0.50

Electronic Systems Div., Air Force Systems Command, Bedford, Mass.
DECISION SCIENCES LABORATORY BIENNIAL PROGRESS REPORT, JULY 1962-JUNE 1964.
Oct 64, 51p
ESD TDR64 609 Unclassified report

Descriptors: (*Human engineering, Information retrieval), (*Decision making, Air force operations), (*Information retrieval, Human engineering), Behavior, Learning, Perception (Psychology), Memory, Teaching machines, Cybernetics, Communication theory, Systems engineering, Reviews.

The Decision Sciences Laboratory initiates exploratory development programs; that is, it estimates and examines future operational requirements of the Air Force, primarily in the area of information processing systems, and determines from such investigation and consideration the implications for man-machine interaction. DSL is also responsible for designing, developing, procuring, evaluating, managing, and updating certain display components of Air Force electronic systems. Further, it provides engineering services to all elements of the Electronic Systems Division within the area on display characteristics, human performance, and man-machine relationship problems for both present and future Air Force Military Information Systems, needs. Topics discussed includes: Data presentation and display; learning, decision making and problem solving; programmed teaching and automated training; and communication theory.

AD-607 462 Div. 28, 16
OTS Prices: HC $4.00/MF $1.00

Boeing Co., Wichita, Kans.
SUBJECTIVE REACTION TO WHOLE-BODY VIBRATION,
by Robert E. Chaney. Sep 64, 139p D3-6474
Contract Nonr2994 00
Unclassified report

Descriptors: (*Human engineering, Vibration), (*Vibration, Tolerances (Physiology), (*Reaction (Psychology), Vibration), Perception, Test methods, Acceleration, Test equipment, Thresholds (Physiology), Posture, Attitudes, Stress (Physiology).

Ten male volunteers were utilized in a study of the perception of vibration. Four subjective reaction levels: perceptible, mildly annoying, extremely annoying, and alarming were established. The Boeing Human Vibration facility, modified since previous tests, was used as the test instrument. Experimental controls and test methods were determined in a preliminary study. Subjective levels identified are generally at higher acceleration values than those of previous research. Possible reasons for the differences are discussed. Also, individual values established at a given subjective level are shown to be influenced by the magnitude of the immediately preceeding vibration level. Physiological effects in the main correlate with previous findings. (Author)

AD-607 472 Div. 28
OTS Prices: HC $1.00/MF $0.50

Aerospace Medical Research Labs, (6570th), Wright-Patterson AFB, Ohio.
A FURTHER STUDY OF THE INFLUENCE OF A RELEVANT BUT UNUSED CUE IN TRAINING UPON TRANSFER IN A POSITIVE TRANSFER SITUATION.
Final technical rept.,
by Gordon A. Eckstrand, Alan D. Neiberg, and Ross L. Morgan. Sep 64, 17p
Proj. 7183, Task 718306
AMRL TDR64 81 Unclassified report
Prepared in cooperation with Ohio State Univ., Columbus Research Foundation, Contract AF33 038 5474.

Descriptors: (*Learning, Transfer of training), (*Transfer of training, Learning), Performance (Human), Training, Recall, Perception (Psychology). Psychometrics.

An attempt was made to assess the utility of a cue that was relevant but not used in the solution of a first task in the learning of a second task. The relationship was such that if something were learned about the relevant but unused cue, positive transfer would be expected to occur. In an earlier experiment, no positive transfer was found in this type of situation. The present study essentially duplicated the first but involved an important procedural modification. This modification was intended to rule out the possibility that subjects in the first study had been trained to disregard this relevant but unused cue. The findings of the present study support those of the earlier one. Even with the revised procedure, no transfer was shown from learning the first task to the learning of a second task on the basis of the cue that was originally relevant but unused. (Author)

AD-607 515 Div. 28, 5, 16
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge Inc., Los Angeles, Calif.
COMMUNICATION BY VIBRATORY TACTILE STIMULI FOR WESCON SYMPOSIUM,
by Joseph Hirsch. 22 Aug 56, 24p
Unclassified report

Descriptors: (*Human engineering, Communication systems), (*Communication systems, Vibration), (*Deafness, Communication systems), Touch, Communication equipment, Auditory perception, Sensory perception, Stimulation, Thresholds (Physiology), Learning, Language, Attention, Blindness, Models (Simulations), Hearing, Symposia.

This paper is concerned with an apparatus and method for communication whereby tactile vibratory stimuli replace or supplement the visual and auditory means, particularly in areas of communication where, 1) threshold levels of pain for other organs exist, such as hearing in an army tank, or 2) to relieve over-saturated sense organs, such as hearing or seeing in high speed aircraft, or 3) where the type of communication requires an 'attention demanding' quality such as would exist in accident prevention in moving vehicles - i. e. , ships, aircraft, trains, etc., and 4) where a necessity exists for speeded communication. In particular, the proposed system could provide the deaf with a 'telephone'. The basic system for communicating through vibratory tactile stimuli consists of a single apparatus whereby the five fingers of the 'speaker' rest on sensitive vibration sending diaphragms, and correspondingly, the five fingers of the 'listener' rest on sensitive vibration receiving diaphragms. A duplicate reversed system allows the 'listener' to become the 'speaker'.

AD-607 667 Div. 28
OTS Prices: HC $2.00/MF $0.50

Washington Univ., Seattle.
CONFIGURAL ANALYSIS,

Descriptors: (*Ramjet engines, Aerodynamic characteristics), (*Adiabatic gas flow, Ramjet engines), One-dimensional flow, Sound, Velocity, Supersonic flow, Shock waves, Two-dimensional flow, Jets, Nozzles, Thermodynamic cycles, Performance (Engineering).

Contents:
One-dimensional gas dynamics (basic relationships, the speed of sound, the Mach number, isentropic compressible flow, the normal shock); Two-dimensional supersonic wave systems (oblique shock waves, Prandtl-Meyer expansions, jet structure); The thrust-producing cycle (thrust and drag, the ramjet thermodynamic cycle); Tabulation of adiabatic Mach number functions.

AD-607 810 Div. 28
OTS Prices: HC $1.00/MF $0.50

Institute of Behavioral Research, Texas Christian Univ., Fort Worth.
DIMENSIONS OF STIMULUS SITUATIONS WHICH ACCOUNT FOR BEHAVIOR VARIANCE.
Annual progress rept.,
by S. B. Sells. 1 Oct 64, 6p
Contract Nonr3436

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Behavior, Theory), (*Performance (Human), Ecology), Attitudes, Personality, Group dynamics, Meteorological parameters, Barometric pressure, Temperature, Humidity, Psychophysiology, Psychometrics, Social psychology.

The studies centered on the identification, isolation, and quantification of situational variables that account for substantial variance in human behavior. The main thesis of the investigation is that behavior variance is a function of three universes of variables: a. individual differences (represented by measures of aptitude, interest, attitude, and personality), b. situational or environmental variables, c. the interaction of individual differences and situational (environmental) variables. It is believed that intensive theoretical and empirical research focused on the area of situational variables will increase understanding of individual behavior and lead to more accurate predictions of individual and group behavior.

29. Quartermaster Equipment and Supplies

No Entries

by Gordon E. Wainwright. Sep 64, 28p
Contract Nonr477 33, Grant PHS MH00743 08

Unclassified report

Descriptors: (*Factor analysis, Psychometrics), (*Psychometrics, Factor analysis), Psychology, Analysis of variance, Polynomials, Functions, Theory.

The first section of this paper presents an explication of 'configuration' as it has come to be used in data analysis. In this section a gamut is run--from interaction in the analysis of variance, through factor analysis to general considerations of prediction. The main theme is the non-additivity or non-linearity of configural information. In section II 'profile analysis' is discussed. There is no particular model associated with profile analysis. It is rather a general approach which has as its goal the separation of groups of similar individuals. Techniques which are frequently used are Q-technique factor analysis and discriminatory analysis. Of some interest is the use of the D measure of Cronbach and Gleser (1953) and 'agreement analysis' proposed by McQuitty (1956). Section III gives a more thorough definition of configural analysis. The configural scale and the polynomial function are given as the two main methods of tapping configural information. Section IV gives the relationship between the configural scale and the polynomial function following Horst (1964). The problem of ascertaining whether configural information is present in a sample of data is briefly discussed and two empirical investigations are cited.

AD-607 739 Div. 28, 23
OTS Prices: HC $2.00/MF $0.50

Naval Training Device Center, Port Washington, N. Y.
THE EFFECTS OF STIMULUS AND FIELD SIZE ON THE ACCURACY OF ORIENTATION IN THE HOMOGENEOUS ENVIRONMENT.
Technical rept.,
by Milton S. Katz, William Metlay, and Paul A. Cirincione. Jul 64, 34p
NAVTRADEVCEN IH13

Unclassified report

Descriptors: (*Visual acuity, Performance tests), (*Visual perception, Targets), Vision, Ranges (Distance), Position finding, Visual signals, Performance (Human), Training devices.

The effects of various size targets and the extent of the visual field on the accuracy of orientation in the homogeneous environment were investigated by requiring S's to reposition, to geometric center, four different targets starting from eleven locations, in a 270 degree homogeneous field. The results showed that: (1) each S positioned all four targets into a preferred field, (2) small error scores and consistency in positioning around perceived centers were found with only three of the four targets, (3) in all cases, the largest error and greatest variability was in centering the smallest target, (4) absolute errors were not related in any systematic fashion to the initial starting points, and (5) with respect to initial target presentations, i.e., left and right fields, Ss errors tended to be smaller in the field containing that S's perceived center. It was suggested, in the discussion, that the variability of the small target could be accounted for, in part, by the autokinetic effect. (Author)

AD-607 740 Div. 28
OTS Prices: HC $3.00/MF $0.75

Fordham Univ., New York.
PERCEPTION OF DISTORTION: AN EXPERIMENTAL STUDY OF DISTANCE AND PERSPECTIVE IN THE AMES TRAPEZOID ILLUSION.
Technical rept.,
by Richard T. Zegers and S. J. Thomas B. Malone. Jun 64, 62p
Contract N61339 1215
NAVTRADEVCEN 1215 1

Unclassified report

Descriptors: (*Perception (Psychology), Visual signals), (*Visual perception, Illusions), Distortion, Geometric forms, Rotation, Correlation techniques, Analysis of variance, Males, Females.

The research examined various factors which could contribute to the reversal illusion perceived with a rotating trapezoid. Variables included in the study were viewing distance, sex, relation to other reversible figures, and to ellipsoidal figures. Distance directly effects the perception of the illusion from four to twenty feet. A consistent sex difference was found in that males perceive the illusion more than females. A significant correlation was found between perception of the trapezoidal illusion and necker cube reversals. In the comparison of symmetrical and asymmetrical figures, it was found that the unbalanced figures resulted in greater perception of the illusion. There was wide variability among subjects in responding to illusion, suggesting that the perception of the illusion results from many visual cues which result in differential responses. (Author)

AD-607 760 Div. 28, 12
OTS Prices: HC $1.00/MF $0.50

Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
HUMAN PERFORMANCE AS A FUNCTION OF INTENSITY OF VIBRATION AT 5 CPS.
Final rept. for 31 Oct 63-11 Mar 64,
by Charles S. Harris, W. Dean Chiles, and Robert M. Touchstone. Sep 64, 21p
Proj. 1710, Task 171002
AMRL TR64 83

Unclassified report

Descriptors: (*Performance (Human), Vibration), (*Vibration, Performance (Human)), Humans, Body, Motion, Extremely low frequency, Stress (Psychology), Acceleration, Environmental tests, Simulation, Space flight, Atmosphere entry, Launching.

The effect on human performance of whole body vibration at a frequency of 5 cycles per second was investigated. Ten subjects were tested on a two dimensional tracking task at four double amplitudes of vibration, 0.08, 0.12, 0.16 and 0.20 inch. Only the two highest levels produced a decrement in performance. No subjective or performance after-effects were found following any of the four 20-minute periods of continuous vibration. (Author)

been assumed that a black box under consideration may be described by a differential equation of a given type with unknown parameters, which are then determined by various optimization methods. In the present memorandum, this approach was extended to the case in which the black box comprises subsystems, each subject to its own differential equation, and in which switching occurs. Methods are explored of determining the nature of the subsystems, estimating the times at which switching occurs, and which subsystems are involved. (Author)

AD-607 463 Div. 30, 22, 25
OTS Prices: HC $4.00/MF $0.75

Randolph-Macon Coll., Ashland, Va.
THE PNEUMATIC ENERGY DETECTOR WITH REMOTE OPTICS (PEDRO).
Final technical rept. for 22 Jun 61-15 Nov 63,
by Richard E. Grove. 15 Nov 63, 102p RMC-30
Contract N178 7904 Unclassified report
See also AD-272 801.

Descriptors: (*Explosives initiators, Electromagnetic fields), (*Electromagnetic fields, Hazards), (*Optical instruments, Monitors), Thermal radiation, Measurement, Diaphragms (Mechanics), Tests, Test equipment, Fiber optics, Glass textiles, Pneumatic devices.

A new instrument is described to measure, for hazards evaluations, the thermal energy produced in the bridgewire of an electroexplosive device by the reception of radiated electromagnetic energy. The device, the pneumatic energy detector with remote optics (PEDRO), employs fiber optics techniques to sense the deformation of an elastic mirrored diaphragm that is distended by the expansion of a small volume of gas heated by the thermal output of the excited bridgewire. Electrical coupling between the instrumentation and the weapon under test is minimized by conveying the information output from the simulated electro-explosive device to the photodetectors as an optical signal through dielectric light pipes composed of bundles of optical fibers. The prototype was capable of detecting 225 microwatts of dc electric power input to the bridgewire. Response was essentially linear between 225 and 6000 microwatts input and non-linear but monotonic increasing for inputs between 6,000 and 22, 000 microwatts. Beyond this, the present form of the apparatus was saturated and no further increase in output was produced. (Author)

AD-607 466 Div. 30, 18, 26
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
APPRAISAL OF LABORATORY SIMULATION EXPERIENCES,
by Murray A. Geisler. Oct 61, 11p P-2467
Unclassified report

Prepared for presentation as the presidential address at the 8th Annual International Meeting of the Institute of Management Sciences, Brussels, Belgium, 24 Aug 61.

Descriptors: (*Management control systems, Simulation), (*Logistics, Models (Simulations)), Management engineering, Systems engineering, Professional personnel, Costs, Operations research, Symposia.

AD-607 468 Div. 30, 16, 28
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
EQUIPMENT USED TO DETERMINE THE EFFECT OF SOUND AND OSCILLATIONS ON THE HUMAN BODY,
by R. Coermann. 3 Nov 47, 22p T-5
TT 64 71598 Unclassified report
Trans. of article from an unidentified source, n.d.

Descriptors: (*Test equipment, Human engineering), (*Oscillation, Performance (Human)), (*Human engineering, Oscillation), Vibration, Body, Shock (Mechanics), Fatigue (Physiology), Frequency, Sound, Electromagnetism, Phase shift, Accelerometers.

This paper comprises a description of test equipment with the aid of which vibrations having a frequency range from 30 to 1000c/sec, and with amplitudes up to 2mm can be transmitted to a human body. Reasons are given for the designs selected and construction difficulties are pointed out. The different oscillators are enumerated and their mode of operation is explained. (Author)

AD-607 470 Div. 30, 7, 8
OTS Prices: HC $3.00/MF $0.75

Parke Mathematical Labs., Inc., Carlisle, Mass.
A MATHEMATICAL MODEL FOR INPUT-OUTPUT DEVICES II.
Scientific rept. no. 6,
by John A. Riley. Aug 64, 64p
Contract AF19 628 2417, Proj. 4608, Task 460805
AFCRL 64 798
Unclassified report

Descriptors: (*Input-output devices, Mathematical models), Algebra, Functions, Systems engineering, Automata, Theory, Reviews.

The technical notion of diagram (as employed by the category-theorists) is used to define the concept of abstract block diagram. The bulk of the report is concerned with the study of the collection 'D' of block diagrams whose input/output functions belong to a preassigned function algebra. It is shown that 'D' may be given the structure of substitution algebra by appropriate definitions of evaluation, substitution and contraction operators. In addition, a brief survey is made of the current literature concerning general input/output systems.

AD-607 476 Div. 30, 8
OTS Prices: HC $1.00/MF $0.50

Electronics Research Lab., Univ. of California, Berkeley.
ANALYSIS OF LINEAR SEQUENTIAL CIRCUITS BY CONFLUENCE SETS,
by Arthur Gill. Jun 64, 15p ERL-64-30
Contract Nonr222 53
Unclassified report

Reprinted from IEEE Transactions on Electronic Computers, Volume EC-13:226-231, no.3, Jun 64.

Descriptors: (*Circuits, Sequences), (*Set theory, Circuits), Linear systems, Analysis, Switching circuits, Groups (Mathematics), Topology, Graphics, Computers, Networks, Transients.

In this paper the group-theoretical concept of 'confluence sets' is introduced as a valuable tool in the analysis of linear sequential circuits (LSC's). Using this concept, a scheme is formulated for producing state graph of autonomous LSC's which, in the 'singular' case, is superior to currently known schemes. Singular LSC's, which are of potential interest in error correction systems, are studied in detail. Properties of their state graphs are derived, culminating in a unique characterization of such graphs in terms of representative 'cycles' and 'trees'. Together with known results on nonsingular circuits, the results in this paper offer a description of the autonomous behavior of the general linear sequential circuit. (Author)

30. Research and Research Equipment

AD-607 417 Div. 30, 25
OTS Prices: HC $3.00/MF $0.75

Westinghouse Research Labs., Pittsburgh, Pa.
DESIGN AND CONSTRUCTION OF HIGH INTENSITY ROTATING ANODE X-RAY TUBE FOR HIGH PRESSURE STUDIES BY X-RAY DIFFRACTION.
Final rept.,
by A. Taylor. 30 Apr 64, 58p
Contract AF19 638 2467, Proj. 5621, Task 562101
AFCRL 64 663

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*X-ray tubes, Design), (*X-ray diffraction analysis, High-pressure research), (*High-pressure research, X-ray tubes), Anodes (Electron tubes), Cathodes (Electron tubes), Circuits, Diffusion pumps, Vacuum apparatus, Construction, Operation.

A high intensity rotating anode x-ray tube has been constructed for use with a tetrahedral anvil press for high pressure studies using x-ray diffraction techniques. The output of the tube is conservatively rated at 150 ma at 35 kV and 70 ma at 50 kV. Tests have shown that the tube may be safely run at 140 ma and 50 kV over prolonged periods of time, with a focal area of approximately 1 x 10 sq. mm. The report gives constructional details of the tube, its associated vacuum equipment and electrical circuitry along with operational instructions and hints on servicing. (Author)

AD-607 420 Div. 30, 8, 25
OTS Prices: HC $1.00/MF $0.50

Yale Univ., New Haven, Conn.
(LISTS OF PROGRESS REPORTS, PUBLICATIONS, AND MEN WHO RECEIVED Ph.D. DEGREES)
Final rept. for 15 Jun 56-15 Feb 64,
by Henry Margenau. 21 Oct 64, 7p
Contract Nonr609 22

Unclassified report

Descriptors: (*Plasma physics, Bibliographies), Reports, Scientific personnel, Electronics.

AD-607 424 Div. 30, 28
OTS Prices: HC $1.00/MF $0.50

Chicago Univ., Ill.
STUDIES OF PATTERN-PERCEIVING AND LEARNING NETWORKS.
Annual rept.,
by Peter H. Greene. 10 Apr 64, 5p
Contract Nonr2121 17, Proj. NR049 148

Unclassified report

Descriptors: (*Artificial intelligence, Pattern recognition), (*Pattern recognition, Artificial intelligence), Learning, Networks, Perception (Psychology), Models (Simulations), Mathematical models, Programming (Computers), Quantum mechanics, Bionics.

AD-607 455 Div. 30, 27, 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
THE TMB TORSIONMETER SHAFT SYSTEM,
by J. Rex Pimlott. Jul 52, 40p
DTMB 825

Unclassified report

Descriptors: (*Shafts, Torsion meters), (*Torsion meters, Marine propulsion), (*Torque, Measurement), (*Marine propulsion, Torsion meters), Ship models, Model basins, Ships, Instrumentation, Power, Drive shafts, Calibration, Operation, Design.

The design and development of a unique torque-measuring system for use during full-scale tests of naval vessels is described. The system consists of a 6-ft section of shafting, especially designed for use with a new torsionmeter, and a special calibration stand for statically load-calibrating the torsionmeter shaft with the torsionmeter. Carefully planned calibration techniques integrate these components into a highly accurate torque-measuring system that has been adopted by the Bureau of Ships for inclusion in new naval vessels. (Author)

AD-607 459 Div. 30, 16
OTS Prices: HC $6.00/MF $1.25

Cornell Univ., Ithaca, N. Y.
SYSTEM AND CIRCUIT DESIGNS FOR THE TOBERMORY PERCEPTRON: PRELIMINARY REPORT ON PHASE I.
Rept. no. 5,
by George Nagy. 1 Sep 63, 218p
Contract Nonr401 40; Grant NSF GP971

Unclassified report

Rept. on Cognitive Systems Research Program.

Descriptors: (*Bionics, Auditory perception), (*Artificial intelligence, Machines), Cybernetics, Circuits, Design, Auditory signals, Band-pass filters, Amplifiers, Relaxation oscillators, Digital systems, Operation, Wiring diagrams, Data.

Tobermory, named after Saki's eavesdropping talking cat, is a general purpose pattern recognition machine roughly modelled on biological prototypes. Phase I, described in this report, consists of four-layer audio-perceptron. The circuits, their design and operation, are described.

AD-607 460 Div. 30, 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SEGMENTAL DIFFERENTIAL APPROXIMATION AND THE 'BLACK BOX' PROBLEM,
by Richard Bellman, Brian Gluss, and Robert Roth.
Oct 64, 29p RM-4269-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Input-output devices, Optimization), (*Differential equation, Numerical analysis), (*Numerical analysis, Differential equations), Switching circuits, Control, Feedback, Dynamic programming, Equations, Iterative methods, Calculus of variations.

In previous work on differential approximation, it has

Descriptors: (*Bibliographies, Machine translation), (*Machine translation, Bibliographies), Language, Vocabulary, Computers, Communication theory.

The bibliography was compiled in order to fill the need for a partial listing of the literature available in machine translation. The nature of the needs at the time of compilation has given a heavy emphasis toward representing the work being done in the Soviet Union. The bibliography should by no means be considered as being complete. (Author)

AD-607 533 Div. 30, 8, 20
OTS Prices: HC $4.00/MF $1.00

International Business Machines Corp., Oswego, N. Y.
AUTOMATED DIGITAL COMPUTER PROGRAM FOR DETERMINING RESPONSES OF ELECTRONIC SYSTEMS TO TRANSIENT NUCLEAR RADIATION. VOLUME I. DEVELOPMENT AND APPLICATION OF DIGITAL COMPUTER PROGRAMS.
Annual rept. no. 2.
Aug 64, 147p
Contract AF29 601 5399, Proj. 5776, Task 577602
WL TDR64 62 V1

Unclassified report

Research has been funded by the Defense Atomic Support Agency, Washington, D. C.
See also AD-607 409.

Descriptors: (*Programming (Computers), Radiation damage), (*Radiation damage, Electronic equipment), (*Electronic equipment, Radiation damage), Digital computers, Circuits, Transistors, Diodes, Capacitors, Simulation, Nuclear particles, Mathematical models, Equations, Functions, Analysis.

The development of digital computer programs for automated circuit and component analysis is reported. This work resulted in the development of the PREDICT and TREAT programs for the IBM 7090. PREDICT is an automated digital computer program for determining transient circuit response which will accept a topological description of a large circuit, evolve and solve the necessary circuit equations, and produce the time history of specified voltages and currents. Transistors, diodes, and capacitors in transient radiation environments are represented by equivalent circuits. TREAT is a system of six programs for the automatic processing of data on the effects of transient and steady-state radiation on transistor, diode and capacitor parameters. The program treats actual and typical device information, evaluates permanent damage to devices, and processes dosimetry information. From actual or typical radiation environment and device data, the theoretical response of certain important device parameters during irradiation can be computed. This output of TREAT can be used directly as an input to PREDICT. (Author)

AD-607 539 Div. 30, 5, 6, 8, 12, 15, 25
OTS Prices: HC $6.00/MF $1.25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
UNCLASSIFIED PUBLICATIONS OF LINCOLN LABORATORY,
15 Mar 64, 210p
Contract AF19 628 500
ESD TDR64 340

Unclassified report

Descriptors: (*Bibliographies, Scientific research), (*Scientific research, Bibliographies), (*Physics laboratories, Scientific research), Reports, Data processing systems, Physics, Radar, Information retrieval, Space communication systems, Engineering, Solid state physics, Reentry vehicles, Indexes, Electronics, Magnetic materials, Semiconductor devices, Lasers, Mathematical analysis, Atmosphere entry, Materials.

The report is a new cumulative listing of unclassfied reports published since the Laboratory was established in 1951. The 15 July 1961 edition of Unclassified Publications, as well as Supplements 1, 2, and 3, may now be destroyed. A Subject Index, included for the first time in this edition, should prove a valuable aid to the reader. Progress Reports, Technical Reports and Group Reports listed herein are deposited with DDC. Out-of-print unclassified (released) reports are available, as microfilm or photoprint copies, from the Microreproduction Laboratory, Hayden Memorial Library, Massachusetts Institute of Technology, Cambridge, Masschusetts 02139. Requests should cite the appropriate serial numbers and prices. (Author)

AD-607 546 Div. 30, 26
OTS Prices: HC $5.00/MF $1.00

System Development Corp., Santa Monica, Calif.
FACTORS THAT AFFECT THE COST OF COMPUTER PROGRAMMING. VOLUME II. A QUANTITATIVE ANALYSIS,
by L. Farr and H. J. Zagorski. Sep 64, 173p
Contract AF19 628 3418
ESD TDR64 448 V2

Unclassified report

Descriptors: (*Programming (Computers), Costs), Determination, Data processing systems, Collecting methods, Statistical analysis, Sampling, Statistical tests, Mathematical prediction, Reliability, Data, Management planning, Analysis.

Results of an exploratory analysis aimed at deriving better cost-estimating relationships for computer programming development are presented. Based equations that estimate costs in terms of such resources as man months and computer hours are derived. Since these estimating devices were evolved from a small and, perhaps, unrepresentative sample of programs, the use of these equations is not recommended for actual planning. The study concludes that multivariate regression analysis, supplemented by pertinent judgment and intuition, is an appropriate tool for deriving cost-estimating relationships. To arrive at more useful prediction equations, recommendations are made for continuing the research. The basic inputs for the analyses, the actual cost data, representing twenty-seven program development efforts, are included. (Author)

AD-607 558 Div. 30, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Lab., Inc., Los Angeles, Calif.
THE DETERMINATION OF COMPENSATION FUNCTIONS FOR LINEAR FEEDBACK SYSTEMS TO PRODUCE SPECIFIED CLOSED-LOOP POLES,
by R. E. Mortensen. 11 Aug 59, 30p
STL/TR-59-0000-00781

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Control systems, Functions), (*Functions, Control systems), (*Feedback, Linear systems), Synthesis, Automation, Simultaneous equations, Calculus of variations,

AD-607 479 Div. 30, 2
OTS Prices: HC $3.00/MF $0.75

Hawaii Inst. of Geophysics, Honolulu.
AN ANALYSIS OF THE RELIABILITY OF GRAVIMETER MEASUREMENTS.
Scientific rept. no. 3,
by G. P. Woollard. Jun 64, 62p HIG-64-9
Contract AF19 628 2849, Proj. 7600, Task 760002
AFCRL 64 771

Unclassified report

Descriptors: (*Laboratory equipment, Gravity), (*Gravity, Instrumentation), Measurement, Reliability, Standards, Laboratory equipment, Environmental tests, Pressure, Temperature, Densimeters, Magnetic fields, Drift, Stability, Calibration, Shock (Mechanics), Geophysics.

Factors affecting reliability of gravimeter measurements are reviewed and results of laboratory test to determine the effect of ambient and time variations in pressure and temperature on a LaCoste-Romberg large geodetic gravimeter presented. By comparing both laboratory calibration measurements and field observation results for two identical instruments (LR-G-1 and LR-G-7) it is possible to evaluate the absolute reliability of values obtained. It is found that in field operations there is a short term (5-10 hour) random variability in response that amounts to as much as 0-1 mgal and that multiple connections over small increments in gravity having an internal accuracy of ±0.02 mgal may differ with instrument by 0.2 mgal. This difference is of the same order as magnitude noted for large increments in gravity. It also appears that the calibration is significantly influenced if the magnetic moment of an instrument changes. (Author)

AD-607 496 Div. 30, 16
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SIMULATION OF TOUCH BY MEANS OF SURFACE ULTRASOUND WAVES,
by L. L. Myasnikov. 15 Oct 64, 8p
FTD TT64 225; TT 64 71600

Unclassified report

Unedited rough draft trans. of Korablestroitel'nyi Institut. Trudy (USSR) 1962, v. 36, p. 103-105.

Descriptors: (*Touch, Simulation), Bionics, Ultrasonic radiation, Hands, Surface properties, Reviews, Mathematical analysis, USSR.

The method of simulating touch is based on the use of surface ultrasonic waves of the megacycle range radiated in the form of impulses and passing around the surface of an 'artificial finger.' The transmitting capacity of the 'artificial finger' was discussed.

AD-607 500 Div. 30
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ABSTRACTION AND PATTERN CLASSIFICATION,
by R. Bellman, R. Kalaba, and L. A. Zadeh. Oct 64,
17p RM-4307-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Pattern recognition, Mathematical logic), (*Mathematical logic, Pattern recognition), Set theory, Metamathematics, Functions, Mathematical programming, Communication theory, Control, Numerical analysis.

This is a preliminary paper in which the authors discuss a general framework for the treatment of pattern-recognition problems. They make precise the notion of a 'fuzzy' set. Then they show how this may be employed in a sequential experimental procedure to ascertain whether a symbol is a member of a particular set or not. The close relation between the problem of pattern recognition and interpolation is stressed. (Author)

AD-607 506 Div. 30, 8
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo-Wooldridge, Inc., Los Angeles, Calif.
THE RAMO-WOOLDRIDGE CORPORATION GENERAL RESEARCH PROGRAM, 1957. SECTION E. MAGNETIC DIGITAL TECHNIQUES.
Progress rept.,
by A. D. Scarbrough and J. J. Nyberg. 15 Jan 58, 7p

Unclassified report

Descriptors: (*Magnetic cores, Digital systems), (*Thin films (Storage devices), Magnetic core storage), Circuits, Electromagnetic properties, Plating, Digital computers.

A progress report is presented on the investigations of digital circuits using ferrite memory cores and thin films.

AD-607 513 Div. 30, 12
OTS Prices: HC $3.00/MF $0.75

Southwest Research Inst., San Antonio, Tex.
INVESTIGATION OF FRICTION, WEAR, AND FAILURE IN AEROSPACE BEARINGS.
Rept. for 1 Feb 63-15 May 64,
by H. E. Staph, W. A. Gunkel, G. F. Munsch, P. M. Ku, and G. Damewood. Sep 64, 80p
Contract AF33 657 10499, Proj. 8128, Task 812801
FDL TDR64 88

Unclassified report

Descriptors: (*Test facilities, Bearings), (*Bearings, Aerospace craft), Test equipment, Temperature, Friction, Wear resistance, Failure (Mechanics), Fracture (Mechanics), Vacuum apparatus, Environmental tests.

The design and construction of a facility for testing aerospace bearings is described. This facility has a target capability of vacuums to 10 to the minus 9th power torr, bearing temperatures up to 1500 F, and speeds to 24,000 rpm. The instrumentation provides for the measurement of linner and outer race temperature, cage temperature, ball temperature, cage strain, and gross slip of the ball and cage unit. The bulk of the measurements are achieved through the use of a 'cage follower,' a platform which rotates in synchronism with the cage, allowing cage mounted transducer leads to be brought out to signal commutating systems. The cage follower has been operated in the vacuum chamber with air environment satisfactorily. A study of aerospace bearing test failures indicates that the cage is the most critical part of the bearing and its fracture is quite often the reason for a test termination. (Auhtbor)

AD-607 514 Div. 30, 32
OTS Prices: HC $1.00/MF $0.50

Thompson Ramo Wooldridge, Inc., Canoga Park,. Calif.
BIBLIOGRAPHY IN MACHINE TRANSLATION,
comp. and tr. by Bozidar Kralevich. 14 Jan 60, 13p
C72-OU1
TT 64 71609

Unclassified report

theory of the direct method is developed via simple geometric and functional concepts. The various methods of developing Liapunov functions are reviewed, and applications are given in the stability analysis of nonlinear regulator systems and in the determination of the properties of their transient behavior. The report also reviews the various techniques for designing systems via the direct method and presents examples of nonlinear and adaptive system designs. The appendices present detailed reports of original contributions to the theory and application of the direct method which were developed during the investigation, and discussions of subjects closely related to stability analysis. (Author)

AD-607 610 Div. 30, 17
OTS Prices: HC $3.00/MF $0.75

North Carolina State Coll., Raleigh.
A DIFFRACTION GRATING METHOD FOR MEASURING ELASTIC-PLASTIC SURFACE STRAINS IN METAL SHEETS.
Final technical rept. for 1 Mar 62-31 Jan 64,
by R. A. Douglas, C. Akkoc, and C. E. Pugh.
May 64, 86p
Contract Nonr3799 01X
NRL TM252 Unclassified report
Legibility of this copy is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Diffraction gratings, Strain (Mechanics)), (*Strain (Mechanics), Sheets), (*Sheets, Diffraction gratings), Metals, Maraging steels, Optical equipment, Diffraction, Elasticity, Plasticity, Tensile properties, Photography, Test equipment, Data.

A procedure is developed for making strain measurements from small, separate, plane diffraction gratings ruled as integral parts of the surfaces of flat metal specimens. Choice of a particular diffraction-strain relationship and the use of master gratings in conjunction with diffraction gratings to be used as strain gages permits use of simple optical instrumentation. Strain measurements resolution and deviation from that of other techniques are examined. The optical diffraction technique in the form employed permits resolving strain increments of magnitude 0.0008 in the range 0.003 to 0.030. Strain measurements are recorded and analyzed from Mar-aging steel specimens containing centrally located notches subjected to axial tension.

AD-607 640 Div. 30, 16, 32
OTS Prices: HC $2.00/MF $0.50

Air Force Cambridge Research Labs., Bedford, Mass.
A CONCISE BIBLIOGRAPHY OF THE LITERATURE ON ARTIFICIAL INTELLIGENCE,
by Alice M. Pierce. Sep 59, 30p
Proj. 4610, Task 46104
AFCRC TN59 773; PB 145 105
Unclassified report

Descriptors: (*Artificial intelligence, Bibliographies), (*Bibliographies, Artificial intelligence), Bionics, Cybernetics, Computers, Nervous system, Physiology, Sensory mechanisms, Simulation.

AD-607 671 Div. 30, 12
OTS Prices: HC $4.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
A CONTACTOR-TYPE DIRECT-DRIVE SERVO.
Master's thesis,
by Douglas R. Sullivan. May 59, 101p T-220
Contract AF04 647 303, Proj. 52 156
Unclassified report
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Accelerometers, Servomechanisms), (*Servomechanisms, Design), Nonlinear systems, Gyroscopes, Feedback, Torque, Mathematical analysis, Functions, Equations, Specifications, Design.

The design and compensation of a synchronous contactor or relay type servo for a pendulous integrating gyro accelerometer is described. Although the servo design is based mainly on the requirements for this system, the compensation techniques discussed can be used in other systems where relay type control is employed. Describing function analysis is used to predict the steady-state operation of the system. Limit cycles with zero and nonzero average value are considered and lead compensation is added to raise the limit cycle frequency. The nonlinearity transfer characteristics are then modified to provide for an increase in torque during transient operation. The describing function for the modified nonlinearity is determined and by an extension of the describing function analysis, the transient response is predicted. The theoretical work is verified experimentally. The results of the experimental work indicate that the describing function approach is an accurate means of analyzing nonlinear systems of this type. (Author)

AD-607 672 Div. 30
OTS Prices: HC $2.00/MF $0.50

Digital Computer Lab., Univ. of Illinois, Urbana.
CIRCUIT RESEARCH PROGRAM, PART I. THE ILLINOIS PATTERN RECOGNITION COMPUTER: ILLIAC III, PART II. IBM 7094-1401 SYSTEM, PART III. GENERAL LABORATORY INFORMATION, PART IV.
Jul 64, 49p C00-1018-1025
Contracts Nonr1834 15, AT11 1 1018
Unclassified report

Descriptors: (*Digital computers, Reports), Computers, Circuits, Equations, Transformations (Mathematics), Pattern recognition, Electronics.

AD-607 679 Div. 30, 15
OTS Prices: HC $3.00/MF $0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
DESIGN OF A SPECIAL PURPOSE DIGITAL SYSTEM.
Master's thesis,
by Alan Irwin Green. Jan 58, 100p T-156
Contract AF04 645 9, Proj. 52 126
Unclassified report

Descriptors: (*Digital computers, Differential equations), (*Differential equations, Digital computers), Simultaneous equations, Linear systems, Integration, Taylor's series, Numerical analysis, Equations, Functions, Programming (Computers), Real time, Digital systems, Errors, Design.

Design specifications are developed for a special purpose digital system required to perform a real time solution of three simultaneous first order linear differential equations with time varying coefficients. The numerical integration procedure followed is based on Taylor series expansions of the variables to be integrated. A program of typical computer instructions is proposed for the solution. An error analysis is performed to determine the parameters necessary to characterize completely the numerical solution and the computer. It is found that a real time solution can be achieved if a sufficient number of terms is kept in the Taylor series expansions. This is feasible if the input data are sufficiently accurate. (Author)

Polynomials, Programming (Computers), Guided missiles (Surface-to-surface), Automatic pilots.

In this report, it was shown how the locations of the closed-loop poles of a feedback control system may be specified and the necessary compensation may be found. This compensation does not require the use of cancellation or nullification of open-loop poles and zeros. The method is exact and involves nothing more difficult than the solution of a set of simultaneous equations. This next problem to be faced is how to specify the locations of the closed-loop poles so that the system meets the requirements without over-constraining anything. A method of getting from general specifications to mathematical constraints is needed.

AD-607 560 Div. 30, 1
OTS Prices: HC $5.00/MF $1.00

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF A METHOD OF ADAPTIVE CONTROL.
Doctoral thesis,
by Paul V. Osburn. 1961, 166p T-266
Contract AF04 647 303

Unclassified report

Descriptors: (*Adaptive control systems, Synthesis), Feedback, Control systems, Flight control systems, Design, Simulation, Mathematical models, Dynamics, Special functions (Mathematical), Graphics, Servomechanisms.

The requirement for the research presented in this thesis is introduced by a brief survey of the development of design concepts and techniques for adaptive control. An analytical procedure is developed to provide a general synthesis method for design of the self-adjustment features of model reference adaptive control systems. Minimization of a mathematical index of performance leads to definition of adjustment signals which can be used to provide for odd-function, nulling control of all the adjustable parameters of a multi-parameter model reference system. Mechanization of parameter control results in systems which are deliberately non-linear in order to provide optimum dynamic performance. Properties of the method are examined by application to a number of typical control situations. Simulation experiments demonstrate the ability of the technique to provide successful adaptation of systems to a wide range of variation in operating environment in response to deterministic and stochastic command and disturbance inputs. (Author)

AD-607 567 Div. 30
OTS Prices: HC $1.00/MF $0.50

RIAS, Inc., Baltimore, Md.
RESEARCH ON CONTROL SYSTEMS.
Final rept. for 15 Nov 62-30 Sep 64,
by R. E. Kalman. Sep 64, 14p
Contract AF49 638 1206, Proj. 9749, Task 974901
AFOSR 64 1788

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Control systems, Theory), Control, Optimization, Stochastic processes, Calculus of variations, Algebra, Automata, Stability, Programming (Computers), Scientific research.

The research under this contract was carried out by the Center for Control Theory at RIAS. The following areas were studied: (1) stability theory, (2) optimal control and calculus of variations, (3) stochastic variational problems, (4) stochastic optimal filters, (5) finite automata and related topics, (6) applied mathematics and digital computation. The main research effort was in the area of stochastic optimization problems. Considerable progress was achieved, both in the realm of stochastic optimal control and stochastic optimal control and stochastic optimal filtering. The problems are now properly formulated and it is finally clear where further research is required and is likely to be fruitful. This work must continue because the results cannot yet be claimed to have real practical significance. A second area of concentration has been the theory of automata. This may be regarded as the algebraic part of control theory, in contrast to the preceding predominately analytical investigations. Much useful work has been accomplished in reconciling automata theory and control theory; much more remains to be done. (Author)

AD-607 575 Div. 30, 12, 19
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
SURVEY OF PRECISION ROTARY TABLES,
by M. F. Popelka, Jr. Jun 60, 19p
STL/TM-60-0000-09053

Unclassified report

Descriptors: (*Test equipment, Tables), (*Tables, Calibration), Laboratory equipment, Optical instruments, Specifications, Test methods, Inertial guidance, Instrumentation, Reviews, Gyroscopes, Accelerometers, Checkout procedures.

This report was generated to satisfy a need for a survey of commercially available precision optical and mechanical rotary tables. The rotary tables catalogued and described here are frequently used as laboratory test platforms for the calibration and test of precision inertial components such as navigational gyroscopes and accelerometers of the type employed in missile and space vehicle development. Data are here tabulated on four basic types of rotary tables, plus a tilting rotary table modified for sidereal rate of rotation. Information includes such items as type, manufacturer's cost, and method of readout. The brief concluding section may be found useful to anyone having to select a table for these applications.

AD-607 602 Div. 30, 1, 12
OTS Prices: HC $7.00/MF $1.50

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
THE ANALYSIS AND DESIGN OF NONLINEAR CONTROL SYSTEMS VIA LIAPUNOV'S DIRECT METHOD.
Rept. for Oct 62-Oct 63,
by Gunther R. Geiss. Aug 64, 316p
Contract AF33 657 9185, Proj. 8219, Task 821904
RTD TDR63 4076

Unclassified report

Descriptors: (*Control systems, Analysis), (*Nonlinear systems, Control systems), Design, Optimization, Stability, Adaptive control systems, Attitude control systems, Satellite attitude, Geometry, Functional analysis, Matrix algebra, Differential equations, Locus, Numerical methods and procedures, Integration.

This report presents the theory of Liapunov's direct method and demonstrates its application in the analysis and design of nonlinear control systems. The report is directed to practicing control system engineers and presents a review of appropriate elements of matrix theory, matrix differential equation theory, and stability theory with reference to control system problems. The

The Air Force Flight Dynamics Laboratory 50-Megawatt Electrogasdynamics Test Facility is a continuous flow, electric arc heated, hypersonic, wind tunnel for re-entry heat transfer and aerodynamic testing in air. A brief description of arc wind tunnel work at the Laboratory is presented. Arc heater test data up to 5 megawatts of power are presented and problems associated with high-pressure operation of these high-voltage heaters are discussed. The 50-Megawatt Arc Heater design is discussed along with the expected performance of the heater and facility. (Author)

AD-607 726 Div. 30
OTS Prices: HC $2.00/MF $0.50

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
THE UNDECIDABILITY OF THE EQUIVALENCE PROBLEM FOR PROGRAM SCHEMATA.
Scientific rept. no. 1,
by David Luckham and David Park. 15 Jun 64, 36p
BBN-1141
Contract AF19 628 3995, Proj. 4641, Task 464102
AFCRL 64 664

Unclassified report

Descriptors: (*Metamathematics, Programming (Computers)), (*Programming (Computers), Metamathematics), Sequences, Combinatorial analysis, Computer logic, Topology, Programming languages.

This paper was concerned with the equivalence problem for program schemata, i.e., for programs written in a certain formal language. This language is designed to express certain general aspects of computer programs; in particular the dependence between computational blocks, branching, and storage allocation. It was shown that the equivalence problem for program schemata is undecidable. (Author)

AD-607 756 Div. 30
OTS Prices: HC $4.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
INVESTIGATION AND IMPROVEMENT OF THE LANNET.
Master's thesis,
by Glen David Wilson. Aug 64, 120p
AFIT GE/EE/64-21

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Artificial intelligence, Digital computers), (*Digital computers, Simulation), (*Learning, Simulation), Bionics, Programming (Computers), Data processing systems, Data storage systems, Programming languages, Electrical engineering, Statistical analysis.

An investigation was conducted to simulate and modify the LANNET in order to improve its problem solving behavior in a maze. A limited analysis of the unmodified LANNET was made to establish a basis for evaluating improvements. The improvements to the LANNET were: (1) optimum path solution for a spatial array; (2) optimum learning rate; and (3) increase in maze size from 8 X 8 to 24 X 24. It was conjectured that the optimum path innovation could be the basis for a vehicle guidance system. The LANNET model developed was shown to be more useful for research than the actual machine. (Author)

AD-607 757 Div. 30
OTS Prices: HC $3.00/MF $0.75

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANALOG SIMULATION OF SAMPLED DATA SYSTEMS.
Master's thesis,
by Emmett Lawrence Finn. Aug 64, 61p
AFIT GE/EE/64-7

Unclassified report

Descriptors: (*Data processing systems, Samplers), (*Samplers, Simulation), (*Analog computers, Samplers), Sampling, Circuits, Design, Relays, Feedback, Equations, Functions, Difference equations, Control systems.

Circuits have been devised in which relay controlled sampling followed by a zero order hold, a first order hold, or no hold may be simulated using available analog computer components and additional capacitors. The narrow sampling impulses are not explicitly generated and the switching rate is determined by the sampling period, providing for satisfactory relay operation. A variation of the state variable approach is presented, based on a partial fraction expansion of the system transfer functions. A method of separating analytically continuous data from sampled data in complex systems, thereby reducing calculations, is suggested. Difference equations for several elementary transfer functions are tabulated. (Author)

AD-607 773 Div. 30, 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
HYDROMECHANICS CAVITATION RESEARCH FACILITIES AND TECHNIQUES IN USE AT THE DAVID TAYLOR MODEL BASIN.
Research and development rept.,
by W. F. Brownell and M. L. Miller. Oct 64, 32p
DTMB 1856

Unclassified report

Presented at Fluids Engineering Division Conference, American Society of Mechanical Engineers, Philadelphia, Pa., 18-20 May 64.

Descriptors: (*Cavitation, Scientific research), Test facilities, Model basins, Ship models, Model tests, Hydrofoils, Propellers (Marine), Water tunnels, Submarines.

The paper briefly describes hydromechanics cavitation research facilities and the testing techniques used when conducting cavitation tests at the David Taylor Model Basin. Facilities for testing scale models of ship propellers, foils and submerged bodies range from the variable pressure water tunnels to the high speed basin with its associated towing carriages and propeller dynamometers. Subcavitating, supercavitating and ventilated model tests are discussed. (Author)

AD-607 779 Div. 30, 15
OTS Prices: HC $2.00/MF $0.50

Systems Research Center, Case Inst. of Tech., Cleveland, Ohio.
RECIPROCITY AND DUALITY IN CONTROL PROGRAMMING PROBLEMS,
by John D. Pearson. 1964, 39p
Contract Nonr1141 12

Unclassified report

AD-607 687 Div. 30
OTS Prices: HC $3.00/MF $0.75

David Taylor Model Basin, Washington, D. C.
A MULTICHANNEL DIGITAL DATA ACQUISITION SYSTEM,
by James A. Luistro. Sep 64, 62p
Proj. SS600 000, Task 1703
DTMB 1630

Unclassified report

Descriptors: (*Analog-to-digital converters, Operation), Input-output devices, Analog systems, Data storage systems, Magnetic tape, Digital computers, Programming (Computers), Multiple operation, Hydrofoils, Harmonic analysis, Test results, Handbooks, Design.

A digital data acquisition system (DIDAS) is discussed with emphasis on its concepts and capabilities. Any arbitrary combination of 43 inputs made up of 36 analog inputs, 6 digital inputs, and 1 events pulse input may be sampled at rates up to 6000 samples per second, digitized where necessary, and recorded on magnetic tape. These output digital tapes are suitable for direct entry into an IBM 7090 or similar digital computer. Since the primary function of DIDAS is to sample, digitize, and record analog data, the system is considered a 36-channel system, and it is with this principal consideration that the operational and performance characteristics are described herein. (Author)

AD-607 697 Div. 30, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
A DIGITAL ANGULAR ACCELERATION MONITOR,
by Patrick B. Hutchings, Jr. 7 Oct 59, 20p
STL/TN-59-0000-09345

Unclassified report

Descriptors: (*Monitors, Acceleration), (*Acceleration, Monitors), (*Digital recording systems, Monitors), Instrumentation, Accelerometers, Tachometers, Display systems, Test equipment, Velocity, Guided missiles (Surface-to-surface).

This report describes the design and construction of a digital acceleration monitor for a constant angular acceleration table. Such a table is desirable for the testing of angular accelerometers such as those used for the MINUTEMAN Control System. This work was performed as a preliminary step in the design of such a constant acceleration table. This monitor processes digital information from a photoelectric tachometer and displays the angular acceleration of the table on a cascade of decade counting units. A theoretical discussion of the operation of the monitor is presented and a detailed schematic of the breadboard model given. The monitor was not checked on a constant acceleration table; however, it did function satisfactorily for constant velocity inputs and definitely proved itself in terms of operating and calibrating simplicity. (Author)

AD-607 702 Div. 30, 12
OTS Prices: HC $1.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
LIMITATION OF ACCELEROMETER TESTING IN A CONSTANT ONE GRAVITY FIELD,
by L. K. Jensen. 10 Nov 58, 11p
STL/GM-TM-0165-00318

Unclassified report

Descriptors: (*Accelerometers, Test methods), Instrumentation, Power series, Fourier analysis, Series, Misalignment, Sensitivity, Mathematical analysis, Theory, Gravity, Inertial guidance, Tests.

The usual method of testing the response of an accelerometer is to orient the instrument so as to pick up varying components of the earth's gravitational field along the instrument's sensitive axis. This method is limited because a maximum of only one gravity unit of acceleration is available and also because the component of acceleration normal to the sensitive axis cannot be varied independently. However, with present techniques the precision obtainable far surpasses other methods such as the centrifuge, so that it is of interest to examine the above mentioned limitations in more detail. This report is principally concerned with the consequences of the second limitation, namely, the interdependence of the accelerations parallel and normal to the sensitive axis. The problem will be attacked by attempting to utilize the results of the one gravity test described above to determine the coefficients of a power series representation of the accelerometer performance. This representation is quite useful in system application of accelerometers and is appealing because the leading coefficients have a clear physical significance. It will be shown, however, that in general, this representation cannot be uniquely established on the basis of tests in a constant gravitational field alone.

AD-607 709 Div. 30, 9, 12
OTS Prices: HC $2.00/MF $0.50

Space Technology Labs., Inc., Los Angeles, Calif.
HIGH TEMPERATURE ARC STUDIES,
by W. R. Grabowsky and D. J. Spencer. 31 Dec 59, 36p STL/TR-59-0000-09934
Contract AF04 647 309

Unclassified report

Descriptors: (*Electric arcs, Test facilities), High-temperature research, Atmosphere entry, Simulation, Heat transfer, Thrust, Enthalpy, Coolants, Power supplies, Gases, Vacuum, Instrumentation, Shock tubes, Refractory materials, Plasma medium, Spectroscopy, Magnetohydrodynamics.

An arc device recently developed at Space Technology Laboratories is described. Details are presented of the arc unit and associated equipment including the power supply, coolant and gas supply system, test section, and instrumentation. Characteristics and modes of operation of the unit are discussed. The unit was developed primarily for operation of a high enthalpy materials test facility. Other specific applications are discussed. (Author)

AD-607 710 Div. 30, 9
OTS Prices: HC $3.00/MF $0.75

Air Force Flight Dynamics Lab., Research and Technology Div., Wright-Patterson AFB, Ohio.
A 50-MEGAWATT ARC HEATER: SCALING PARAMETERS AND PERFORMANCE PREDICTION,
by Richard T. Smith and Joseph P. Doyle.
Aug 64, 64p
Proj. 1426, Task 142612
FDL TDR64 91

Unclassified report

Descriptors: (*Wind tunnels, Heaters), (*Heaters, Electric arcs), Test facilities, Aerodynamic heating, Atmosphere entry, Hypersonic flow, Heat transfer, Performance (Engineering), Design, Scale.

operation, and expanding the logical possibilities of digital differential analyzers; and (2) Integration block of a digital integrating machine.

AD-607 881 Div. 30
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
THEORETICAL BASES OF THE METHOD OF POTENTIAL FUNCTIONS IN THE PROBLEM ABOUT INSTRUCTION OF AUTOMATIC MACHINES ABOUT SEPARATION OF ENTRANCE SITUATIONS OF CLASSES,
by M. A. Aizerman, E. M. Braverman, and L. I. Rozonoer. 22 Oct 64, 40p
FTD MT64 255; TT 64 71644

Unclassified report

Edited machine trans. of mono. Teoreticheskie Osnovy Metoda Potentsial'nykh Funktsii v Zadache ob Obuchenii Avtomatov Razdeleniyu Vkhodnykh Situatsii na Klassy, Moscow, 1963, 46p.

Descriptors: (*Reading machines, Programming (Computers)), (*Pattern recognition, Reading machines), Potential theory, Functions, Input-output devices, Special purpose computers, Artificial intelligence, Cybernetics, USSR.

Algorithms of instruction of automatic machines for identification of classes of entrance situations are presented, on the basis of which lies the construction of so-called potential functions. The basic hypothesis for consideration is introduced about the character of functions, which divide sets corresponding to different classes of entrance situations. Proceeding from this hypothesis, theorems of convergence of algorithms for a finite number of steps are proved. Appears that these algorithms are realized by a broad class of diagrams. The characteristics of elements, from which are gathered the diagrams of this class, are practically arbitrary. It appears that the perceptron of Rosenblatt pertains to this class of diagrams, i.e., it is proved that the work of the perceptron may be comprehended as a realization of the method of potential functions. In connection with this the proven theorems of convergence of algorithms of potential functions resolve also the problem about convergence of the process in the perceptron. (Author)

AD-607 885 Div. 30, 5
OTS Prices: HC $3.00/MF $0.75

Rome Air Development Center, Griffis AFB, N. Y.
FLOPAK: FLOATING POINT PROGRAMING PACKAGE,
by Steve Cordell. Oct 64, 58p
RADC TDR64 395

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Programming (Computers), Communication systems), Programming languages, Communication systems), Real time, Automatic, Compilers.

FLOPAK is a Packard-Bell 250 Computer semi-automatic, floating-point programing system which may be operated simultaneously in either of two modes. The first is a non-time optimized mode which may be used by inexperienced coders; the second mode is a high-speed, fully time-optimized floating-point arithmetic system which an experienced programer may use in real-time computations and in general, single precision calculations. It is the only PB-250 floating-point system available which may be used in real-time control. The system was originally designed to solve a real-time communication problem.

AD-607 889 Div. 30
OTS Prices: HC $7.00/MF $1.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AUTOMATIC CONTROL AND COMPUTER TECHNIQUE: SELECTED ARTICLES,
25 Aug 64, 356p.
FTD MT64 270; TT 64 71653

Unclassified report

Edited machine trans. of Avtomaticheskoe Upravlenie i Vychislitel'naya Tekhnika (USSR) 1958, no. 1, p. 1-304.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Computers, Scientific research), Automatic, Control systems, Servomechanisms, Pneumatic devices, Hydraulic systems, Communication theory, Digital computers, Analog computers, Amplifiers, Cybernetics, Mathematics, USSR.

Contents:
Basic features of engineering cybernetics, by V. V. Solodovnikov; Certain questions of synthesis of sampled data, servo systems with stationary random inputs, by L. T. Kuzin; On selecting parameters of self-excited automatic control systems, by Ye. P. Popov; Complete 'frequency'description of random processes and certain problems of performance of control systems, by S. Ya. Rayevskiy; Certain new applications of the method of logarithmic frequency characteristics for investigation of automatic control systems, by N. T. Kuzovkov; Electro-hydraulic controllers, by Yu. Ye. Ruzskiy; Investigation of pneumatic and hydraulic servomechanisms, by V. N. Chelomey; Magnetic amplifiers for systems of automatic control, by M. A. Rozenblat; Electromagnetic clutches for actuating mechanisms, by P. F. Klubnikin; Mathematical bases of a digital differential analyzer, by Ye. P. Zhidkov; Digital integrating machines, by F. V. Mayorov.

AD-607 910 Div. 30, 8
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
OPTIMUM CONTROL WITH FEEDBACK SIGNAL DELAY,
by N. N. Krasovskii. 3 Sep 64, 28p
FTD MT64 40; TT 64 71652

Unclassified report

Edited machine trans. of Avtomatika i Telemekhanika (USSR) 1963, v. 24, no. 8, p. 1021-1036.

Descriptors: (*Control systems, Optimization), (*Time-lag theory, Feedback), Automatic, Control, Stochastic processes, Dynamic programming, Vector analysis, Functional analysis, USSR.

The problem of determining an optimum law of control, minimizing integral appraisal of quality of the process when there are random actions in the system, and feedback signal delay was considered. The optimality criterion, based on the ideas of the Lyapunov method of functions and on principles of dynamic programming, was formulated. Effective calculation of the given control, minimizing mean-square error, was described. (Author)

AD-607 913 Div. 30, 15
OTS Prices: HC $5.00/MF $1.00

Systems Research Center, Case Inst. of Tech.,

Descriptors: (*Control systems, Programming (Computers)), (*Programming (Computers), Control systems), Optimization, Calculus of variations, functional analysis, Geometry, Errors.

A general control programming problem of minimising a 'primal' functional subject to differential and inequality constraints, is transformed into a reciprocal form where the extremal curve is unchanged, but the roles of the state and adjoint variables are interchanged. Conditions are given for this stationary extremal to maximise the reciprocal functional, thus generating a 'dual' problem. Applications are made to error estimation of approximate control schemes. (Author)

AD-607 833 Div. 30, 26
OTS Prices: HC $1.00/MF $0.50

General Electric Co., Utica, N. Y.
PROGRAM EVALUATION AND REVIEW TECHNIQUE (PERT) FORMULATED FOR DIGITAL COMPUTER APPLICATION,
Technical Information Series,
by R. P. Larsen. 15 Jun 60, 20p R60EML48
Unclassified report

Descriptors: (*Management control systems, Programming (Computers)), (*Programming (Computers), Management control systems), Digital computers, Management engineering, Time, Data.

The implementation of PERT (Program Evaluation and Review Technique) to a digital computer provides an economical means for schedule simulation, analysis and monitoring of a complex engineering development program. It is the primary objective of this presentation to formulate PERT's procedural mechanics in digital computer terminology. It is assumed the reader possesses a fundamental knowledge of PERT, therefore the emphasis is on the analytical formulation of statistical time measures which characterize a scheduled program. For a subjective treatment of PERT, see T.I.S. R60EML46. (Author)

AD-607 839 Div. 30
OTS Prices: HC $1.00/MF $0.50

Philco Corp., Palo Alto, Calif.
ALGY-AN ALGEBRAIC MANIPULATION PROGRAM.
Technical note,
by Edward D. Callender. 29 Nov 62, 24p WDL-TN62-3
Contract AF04 695 113
Unclassified report

Descriptors: (*Programming (Computers), Algebra), (*Algebra, Programming (Computers)), Compilers, Input-output devices, Digital computers, Computer logic.

In a great variety of scientific problems, the reduction of complex analytical expressions is highly desirable but often such reductions, although straight forward, are extremely lengthy and laborious. This paper describes a program written for a high-speed digital computer which accepts algebraic expressions as input and outputs a similar set of modified expressions. The description includes the definition of the ALGY operations used to obtain the desired results, followed by an explanation of the logical flow of the program, and concluding with a description of future operations which will be incorporated into the system. (Author)

AD-607 850 Div. 30, 2
OTS Prices: HC $3.00/MF $0.75

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
REPORT OF THE JULY 1959 CONFERENCES ON RANGE METEOROLOGICAL INSTRUMENTATION SYSTEMS,
Sep 59, 60p
Unclassified report

Rept. covers two separate conferences, one held at the Pentagon, Wash., D. C., 7-9 Jul 59, and the other at Air Force Ballistic Missiles Div., Los Angeles, Calif, 14-16 Jul 59.

Descriptors: (*Meteorological instruments, Guided missile ranges), Ranges (Establishments), Instrumentation, Weather forecasting, Scientific organizations, Scientific personnel, Symposia.

The purpose of these conferences was to determine what meteorological information was required by the users of missile test ranges, what accuracy of measurement was required, what factors or components were being evaluated in tests, and how the meteorological data would be used in arriving at decisions concerning the evaluations. This report contains the results of those conferences.

AD-607 865 Div. 30
OTS Prices: HC $3.00/MF $0.75

Space Technology Labs., Inc., Los Angeles, Calif.
NONLINEAR CONTROL SYSTEM STABILITY VIA THE SECOND METHOD OF LYAPUNOV,
by L. K. Timothy. 1 Sep 60, 64p
STL/TR-60-0000-19287
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Control systems, Stability), Nonlinear systems, Real time, Differential equations, Functional analysis, Matrix algebra, Numerical analysis, Invariance.

The 'second method of Lyapunov' is, at present, the most general approach to investigating the stability of ordinary differential equations (linear or nonlinear with time varying coefficients). This disseration was primarily concerned with two areas: (1) To communicate to the engineer the basic principles of Lyapunov and (2) To demonstrate a rather general, but concise, approach to applying Lyapunov to the study of control systems.

AD-607 877 Div. 30
OTS Prices: HC $2.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COMBINATION COMPUTERS: SELECTED ARTICLES,
by A. V. Kalyaev, B. V. Barun, E. M. Zelinskii, and V. I. Sergienko. 9 Oct 64, 34p
FTD MT64 218; TT 64 71641
Unclassified report

Edited machine trans. of mono. Vsesoyuznaya Konferentsiya-Seminar po Teorii i Metodam Matematicheskogo Modelirovaniya (All-Union Conference on Theory and Methods of Matematical Modeling) (no. 2) Moscow, 1961. Trudy, 1962, p. 80-91, 106-113.

Descriptors: (*Digital differential analyzers, Reports), Computers, Control sequences, Integrators, Computer storage devices, Electronic equipment, Design, Mathematical models, USSR.

Contents: (1) On methods of increasing the high speed

31. Ships and Marine Equipment

AD-607 427 Div. 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
HULL FORM RESEARCH WITH A FLEXIBLE MODEL,
by P. C. Pien. Nov 59, 44p
DTMB 1344

Unclassified report

Descriptors: (*Ship models, Flexible structures), (*Model tests, Hulls (Marine)), (*Hulls (Marine), Model tests), Mechanical properties, Experimental data.

A project of finding the effect of the change in sectional area curve of a ship model upon resistance has been initiated at the David Taylor Model Basin by using a flexible model technique. In this technique a flexible model was built. The sectional area curve of this model can be readily changed from one form to another. Thus the necessity of building a large number of models in the above mentioned project has been eliminated. The design considerations and the details of construction of a flexible model, Model 4634, are given. The mechanical properties of this model have been found to be satisfactory. The results of a short experimental program of nine different forms are given. (Author)

AD-607 447 Div. 31
OTS Prices: HC $3.00/MF $0.75

David Taylor Model Basin, Washington, D. C.
RESULTS OF EXPERIMENTS WITH MODEL OF HIGH SPEED TOWING TARGETS INCLUDING ESTIMATES OF FULL-SCALE TARGET DRAG AND CABLE TENSION,
by J. H. Curry and Jack Posner. Nov 47, 83p
DTMB 595

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Surface targets, Towed bodies), (*Hulls (Marine), Surface targets), Models (Simulations), Stability, Drag, Towing cables, Loading (Mechanics), Stresses.

Five models of high-speed towing targets, two flat-bottom sled-types, two vee-bottom boat-types from Bureau of Ships designs, and one vee-bottom toboggan-type David Taylor Model Basin design, were tested in an attempt to develop an improved type towing target. The models were towed in the basin (a) by a long cable attached to the dynamometer, and (b) under the towing carriage with load increments applied to simulate various lengths of cable. It was found that for a given displacement and initial trim, a change in tow-point position, within the limits covered by the tests, has little effect on target resistance or directional stability. The resistances of the two boat-type targets and of the TMB design target were appreciable less when they were towed by a single cable in place of the conventional bridle, but the effect on the directional stability was small. When towed by the single cable the targets had a tendency to be self righting, after deliberately being capsized. (Author)

AD-607 452 Div. 31, 9
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
A METHOD FOR PREDICTING THE TORQUE OF SEMIBALANCED CENTERLINE RUDDERS ON MULTIPLE-SCREW SHIPS,
by S. C. Gover and C. R. Olson. Nov 54, 20p
DTMB 915

Unclassified report

Descriptors: (*Marine rudders, Torque), (*Torque, Marine rudders), Mathematical prediction, Model tests, Tests, Navel vessels (Combatant), Multiple operation, Propellers (Marine).

An empirical method is presented for predicting the torque required for semibalanced rudders not directly in the propeller slipstream. An example of the method is given and theory, full-scale trials, and model test results are compared. (Author)

AD-607 493 Div. 31, 8
OTS Prices: HC $3.00/MF $0.75

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
HYDRODYNAMICS AND STABILITY AND CONTROL OF A TANDEM PROPELLER SUBMARINE: EQUIPMENT DESIGN FOR A TANDEM PROPELLER SUBMARINE FREE-RUNNING MODEL.
Final rept. Phase 3, App.,
by Roy S. Rice and William G. Wilson. Sep 64, 100p
CAL-AG-1634-V-5
Contract Nonr3659 00

Unclassified report

See also AD-606 803.

Descriptors: (*Submarines, Propulsion), Computers, Analog computers, Control systems, Position finding, Propellers (Marine), Configuration, Servomechanisms, Ship models, Electrical equipment, Design, Hydrodynamics, Stability, Electronic equipment.

The report contains information on the design, installation, and interconnections of equipment used in the free-running model test program. Emphasis is placed on describing those portions of the system designed and assembled by CAL for these specific tests and for which information is not elsewhere available. Where possible, reference is made to prior publications for descriptions of equipment which was supplied with the model (e. g., the propeller and blade actuator servomechanisms) or which was used in unmodified form for remote control demonstrations (e. g., the Conalog). Certain changes in the supplied equipment, as used in earlier captive tests of the model, were made for compatibility with units introduced into the system for free-running tests and these changes are noted where applicable.

AD-607 588 Div. 31, 13, 25
OTS Prices: HC $6.00/MF $1.25

Conesco, Inc., Cambridge, Mass.
DEVELOPMENT OF NOISE MEASUREMENT TECHNIQUES AND PROCEDURES FOR USE IN FLUID PIPING SYSTEMS.
Apr 64, 255p CONESCO-F-123-1
Contract NObs88557, Proj. S F013 11 01, Task 1355

Unclassified report

Descriptors: (*Submarine noise, Measurement), (*Pipes, Submarine noise), Sound transmission, Sound signals, Turbulence, Fluid flow, Attenuation, Hydrophones, Plastics, Acoustic filters, Air, Bubbles, Tests, Submarines, Errors.

The report presents the results of experimental and theoretical studies of four aspects of acoustic measurements in piping systems. The first deals with the effects

Cleveland, Ohio.
MULTI-LEVEL APPROACH TO DYNAMIC OPTIMIZATION,
by Yasuhiko Takahara. May 64, 161p
SRC-59-A-64-21
Contract Nonr1141 12

Unclassified report

Descriptors: (*Optimization, Control systems), Control, Dynamics, Iterative methods, Functional analysis, Statistical processes, S-matrix, Dynamic programming, Linear systems, Sequences, Transformations (Mathematics).

In this report multi-level systems theory was applied to linear dynamic optimization problems. The two main reasons for using multi-level approach to optimization problems are: (a) this method eases the difficulty of computation of large scale optimization problems; (b) this method may make control systems insensitive to disturbances. In this report reason (a) above was considered in detail. The technique used is as follows. A large scale control system is divided into smaller subsystems by the 'decomposition technique' neglecting the interactions among the sybsystems. The 'higher level goal-seeking units' compensate for the neglected interactions through successive approximation. The convergence condition of the successive approximation was treated. (Author)

AD-607 955 Div. 30, 2, 12
OTS Prices: HC $2.00/MF $0.50

Technical Operations, Inc., Burlington, Mass.
DEVELOPMENT OF A RESEARCH CAPABILITY FOR ACCELERATING HYPERVELOCITY PARTICLES.
Final rept.,
by H. C. Stevens, R. W. O'Neil, and V. E. Scherrer.
30 Oct 64, 42p TO-B-64-89
Contract AF33 657 10316, Proj. 7360, Task 736006
AFML TR64 333

Unclassified report

Descriptors: (*Hypervelocity guns, Design), (*Meteorites, Simulation), Test facilities, Hypervelocity projectiles, Particles, Acceleration, Capacitors, Electric discharges, High-speed photography.

The work involved the development and installation of a hypervelocity facility for accelerating small particles to meteoric velocities for simulating the effects of micrometeoroid impact on materials. The particles are accelerated by discharging an electronically-triggered, high-energy capacitor storage system into an exploding-foil gun. High-speed streak and framing cameras measure particle velocity, size, shape, and momentum. Electronic instrumentation is provided to measure capacitor bank discharge characteristics and energy input to the exploding-foil gun. Particles have thus far been accelerated in this facility to velocities greater than 40,000 ft/sec. (Author)

AD-607 972 Div. 30
OTS Prices: HC $3.00/MF $0.75

Goodyear Aerospace Corp., Akron, Ohio.
GOODYEAR AEROSPACE TEST FACILITY ARC HEATED WIND TUNNEL.
Rept. for 15 Apr 62-15 Oct 63,
by Kenneth A. Young and Joseph J. Meola. Oct 63, 59p
Contract AF33 616 7599, Proj. 7381, Task 73812
RTD TDR63 4090 Unclassified report

Descriptors: (*Wind tunnels, Test facilities), Simulation, Atmosphere entry, Steam, Generators, Electrodes, Gas flow, Control panels, Cooling, Heat transfer, Enthalpy, Diffusers, Fuel consumption, Spectroscopy, Instrumentation, Performance (Engineering), Test methods, Design.

A summary of tests conducted in the Goodyear Aerospace Arc Heated Wind Tunnel is presented. This hyperthermal test facility is a non re-circulating arc tunnel with a continuous steam ejector evacuation system. The 1.8 megawatt input power is supplied by three diesel-electric locomotives. The arc or plasma generator utilizes water cooled concentric copper electrodes with magnetic spin stabilization. The arc operation time, arc head component life and diesel power utilization are summarized. Test procedures and operation of the arc tunnel are described. Development and modifications to the facility are discussed. Brief results and discussions of company funded test programs of a development nature are presented. The simulation capabilities and the operating envelope of the arc tunnel are given along with the typical test points attained during the report period. (Author)

AD-607 981 Div. 30, 15
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ADAPTIVE SEGMENTAL DIFFERENTIAL APPROXIMATION,
by Richard Bellman and Brian Gluss. Nov 64,
13p RM-4314-PR
Contract AF49 638 700

Unclassified report

Rept. on Proj. RAND.

Descriptors: (*Differential equations, Numerical analysis), (*Numerical analysis, Differential equations), (*Input-output devices, Identification), Switching circuits, Nonlinear systems, Linear systems, Quality control, Iterative methods, Dynamic programming.

An important new method was considered for solving the 'inverse problem' of identifying the nature of black boxes from their outputs. When the box is known to have differential characterizations of known parametric types, where the values of the parameters are unknown, the method is exact and computationally economical. (Author)

Descriptors: (*Ships, Motion), (*Oscillation, Damping), Pitch (Motion), Geometric forms, Green's function, Boundary value problems, Mathematical analysis.

A study was made of a floating or submerged body with longitudinal and transverse symmetry, which is moving with constant forward speed and performing small oscillations. The analysis is quite general in the sense that the shape of the body and the nature of the oscillations are unspecified, but it is assumed that the linearized free-surface condition holds. With this assumption the oscillatory velocity potential is found in terms of an unknown Green's function, the existence of which is also assumed. This potential is then used to show the symmetry properties of the cross-coupling damping coefficients. (Author)

AD-607 912 Div. 31, 9
OTS Prices: HC $3.00/MF $0.50

Measurement Analysis Corp., Los Angeles, Calif.
EXTREME VALUES OF RANDOM PROCESSES IN SEAKEEPING APPLICATIONS.
by George P. Thrall. Aug 64, 53p MAC-307-03

Contract Nonr4305 00, Proj. S R009 01 01
Unclassified report

Descriptors: (*Statistical processes, Hydrodynamics), (*Hydrodynamics, Statistical processes), Marine engineering, Fluid mechanics, Wind, Ocean waves, Height finding, Mathematical prediction.

In many seakeeping applications, it is desirable to know the probability that a particular random process, such as the height of the sea at a given point, exceeds a predetermined level during an interval of time. The basic mathematical analysis of extreme values is presented. Bounds are obtained for two distinct cases: In the first case, only the covariance function of the process is assumed to be known; while in the second case, the joint distribution of the process and its first derivative are considered known. The results are applied to various seakeeping applications. In particular, bounds on the probability of extreme wave heights are developed and analyzed using the proposed spectrum of Pierson and Moskowitz for fully developed seas. Similar results are also obtained for the energy associated with a random process. Finally, recommendations are made to extend the work on both a theoretical and experimental basis.

of air in the system, the second deals with the use of transparent plastic test systems, and the third and fourth studies deal with the background levels associated with turbulent fluid flowing past a hydrophone and with the generation of acoustic signals by high velocity flows through devices which are meant to act as attenuators.

AD-607 666 Div. 31, 25
OTS Prices: HC $2.00/MF $0.50

General Applied Science Labs., Inc., Westbury, N. Y.
EXTENSION OF PROPELLER BLADE STRESS PROGRAM,
by E. Lieberman and J. Hoffman. Oct 64, 27p
GASL-TR-466
Contract Nonr4321 00

Unclassified report

Descriptors: (*Programming (Computers), Load distribution)), (*Propellers (Marine), Stresses), (*Stresses, Propellers (Marine)), Mathematical analysis, Loading (Mechanics), Marine engineering, Matrix algebra, Mathematical models.

The computer program now has the capability of utilizing 108 degrees of freedom in the process of generating stress distributions for propeller blades. The results of such a test run have been plotted and may be compared with similar plots of results which were generated using 84 degrees of freedom. These comparisons indicate that no radical change in stress contours occurs as a result of increasing the number of degrees of freedom from 84 to 108; indeed, there is a marked similarity between the two sets of plots. This similarity indicates that the solution has 'settled down' and that 108 degrees of freedom are adequate for the purpose of depicting the variation of displacement components over the planform of propeller blades. Thus, increased confidence is warranted in the capability of the subject computer program to generate accurate stress distributions for static, distributed loadings on propeller blades. (Author)

AD-607 692 Div. 31
OTS Prices: HC $2.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
SMOOTH-WATER TESTS OF MODEL 4990 REPRESENTING A 36-FOOT RIVER PATROL BOAT.
Research and development rept.,
by Lawrence Benen. Oct 64, 32p
Proj. S F014 02 02
DTMB 1914

Unclassified report

Descriptors: (*Patrol craft, Model tests), Models (Simulations), Hulls (Marine), Marine propulsion, Propellers (Marine), Air, Performance (Engineering), Test methods.

Tests, using TMB Model 4990, were made in Langley Tank No. 1 to determine the performance characteristics of a 36-Foot River Patrol Craft. Model 4990 is a revision of Model 4974 which had a deep tunnel forward. This tunnel was instrumental in collecting air under the hull, lowering the effectiveness of the propulsion screws. Model 4990 had the forward tunnel removed and replaced by a convex section terminating in a blunt bow. The tests indicate that no air was entrained under the bow of the modified model, but the EHP at the design operating conditions was increased. Spray over the bow and side of the model was eliminated by use of spray strips. Test results for two displacements with and without spray strips are presented. (Author)

AD-607 720 Div. 31
OTS Prices: HC $3.00/MF $0.75

David Taylor Model Basin, Washington, D. C.
HYDRODYNAMIC ASPECT OF PROPELLER DESIGN BASED ON LIFTING-SURFACE THEORY. PART I. UNIFORM CHORDWISE LOAD DISTRIBUTION.
Research and development rept.,
by Henry M. Cheng. Sep 64, 75p
DTMB 1802

Unclassified report

Descriptors: (*Propellers, (Marine), Load distribution), (*Load distribution, Propellers (Marine)), Design, Fluid dynamic properties, Mathematical analysis, Programming (Computers), Hydrodynamic configurations, Lift.

This report presents a method of the propeller camber calculations for the case of uniform chordwise load distribution employing the lifting-surface theory. This is essentially a refinement of Pien's published work on propeller lifting-surface theory. Mathematical development pertinent to the numerical computation is reviewed. Details of the computational procedure and method are outlined, and results of sample calculations are included. A detailed instruction for preparation of input data for the computer, samples of the computer input data and output, and the FORTRAN listing of the computer program are also given. (Author)

AD-607 765 Div. 31
OTS Prices: HC $3.00/MF $0.75

Southwest Research Inst., San Antonio, Tex.
STUDIES OF SHIP ROLL STABILIZATION TANKS.
Technical rept. no. 1,
by John F. Dalzell, Wen-Hwa Chu, and J. Everett Modisette. Aug 64, 76p
Contract Nonr3926 00, Projs. 02 1268, S R009 01 01

Unclassified report

Descriptors: (*Ballast tanks, Roll), (*Roll, Stabilization systems), Ship structural components, Rectangular bodies, Design, Damping, Moments, Fluid dynamic properties, Ships.

The report summarizes the background to and development of a quasi-linear theory for 'rectangular' type anti-rolling tanks, and presents results of the ensuing experimental investigation. Both theoretical and experimental methods are described and comparisons between theory and experiment are made. It was found that though the initial theoretical method reflects the gross behavior of the fluid in the tank and the moments exerted on the ship therefrom, it should be regarded as the basis on which to build a better understanding rather than as a design technique. Experimental findings also indicate that the anti-roll tank is a non-linear control element over its practical range of operation. It is recommended that a non-linear mathematical representation be developed which incorporates empirical results, as necessary. (Author)

AD-607 775 Div. 31
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
THE COUPLED DAMPING COEFFICIENTS OF A SYMMETRIC SHIP.
Research and development rept.,
by R. Timman and J. N. Newman. May 62, 13p
DTMB 1610

Unclassified report

INDEXES, 1928-1962,
by N. M. Kaplan. Nov 64, 67p RM-4264-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Transportation, USSR), (*Communication systems, USSR), (*Economics, USSR), Cargo vehicles, Railroad cars, Passenger vehicles, Costs, Labor, Money, Industrial production, Weight, Equations, Statistical data, United States.

Comparisons between the USSR growth rates and those for the United States indicate that in general the rates of increase of output for Soviet transport and communications and their major components greatly exceed those in the United States from 1869 to date. Comparisons between the Soviet increase in transport and communications output and the increases in labor and capital inputs reveal that the output increase exceeds the combined inputs increase and each of the input increases considered separately. United States data for the same sector show the same inequalities. Although the average capital-output ratio for the USSR has continued to decline over time, the incremental capital-output ratio in recent years has increased markedly after earlier declines.

AD-607 777 Div. 32
OTS Prices: HC $4.00/MF $0.75

RAND Corp., Santa Monica, Calif.
REPORT ON A LONG-RANGE FORECASTING STUDY,
by T. J. Gordon and Olaf Helmer. Sep 64, 120p
P-2982

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Management planning, Economics), (*Economics, Probability), (*Scientific research, Probability), Statistical analysis, Determination, Reliability, Population, Astronautics, Warfare, Automation, Weapon systems.

This report describes an experimental trend-predicting exercise covering a period extending as far as fifty years into the future. The experiment used a sequence of questionnaires to elicit predictions from individual experts in six broad areas: scientific breakthroughs, population growth, automation, space progress, probability and prevention of war, and future weapon systems. Results of the experiment illuminate a number of points: the contents of the predictions themselves, the bases on which respondents claimed their predictions were made, the spread of expert views, the convergence of views following data feedback, the expert's critiques of each other's views, and not least of all, the weaknesses of the method and the possible means for improving it.

AD-607 854 Div. 32
OTS Prices: HC $4.00/MF $1.00

Foreign Tech. Div., Air Force Systems Command,
Wright-Patterson AFB, Ohio.
PROBLEMS OF THE INTERNATIONAL EXCHANGE OF PUBLICATIONS (COLLECTION OF REPORTS AT THE SCIENTIFIC CONFERENCE OF THE LIBRARY OF THE ACADEMY OF SCIENCES USSR) (NO. 7).
14 Aug 64, 114p
FTD MT64 197; TT 64 71638

Unclassified report

Voprosy Mekhdunarodnogo Kingoobmena, edited machine trans. of mono. Nauchnaya Konferentsiya Biblioteki Akademii Nauk SSSR (no. 7) Leningrad, 20-22 Apr 61. Sbornik Dokladov. 1962, 134p.

Descriptors: (*USSR, Scientific organizations), (*Libraries, Scientific research), (*Scientific organizations, Libraries), (*Symposia, Libraries), Reports, Government (Foreign), Foreign policy.

The reports read at the Seventh Scientific Conference of the Library of the Academy of Sciences USSR are published in this collection. Problems concerning the organization of international book-exchange in the system of the Academy of Sciences USSR, peculiarities of the exchange ties with the socialist and principal capitalist countries, and peculiarities of the ties with the Eastern countries are examined in these reports. The experience of many years of the Library of the Academy of Sciences USSR in international book-exchange is summarized. This publication is intended for library and other workers handling problems of international book-exchange. (Author)

33. Transportation

AD-607 592 Div. 33
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
ON MINIMIZING THE LAND USED BY AUTOMOBILES AND BUSES IN THE URBAN CENTRAL CORE: UNDERGROUND HIGHWAYS AND PARKING FACILITES,
by George A. Hoffman. Oct 64, 37p P-3002

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Roads, Underground structures), (*Underground structures, Traffic), (*Urban areas, Passenger vehicles), Optimization, Transportation, Costs, Urban planning, Earth handling equipment, Rock (Geology).

Possibilities for reducing the land used for urban transportation in the central city core by providing ample automotive access with deep underground tunnels and parking areas are examined. The cost of conventional urban highways built through densely populated areas is described in terms of construction costs, right-of-way acquisition costs, and selected operating expenditures. Construction and ventilating costs of vehicular tunnels are presented. Beside this economic advantage of subterranean vehicular tubes, some design features of underground construction and travel are next considered, such as tunneling machines, rock removal, prefabricated lining and roadways, adaptability to mass-transit systems, land reclamation, traffic control, and obstacle removal. The study considers what may be needed if all mass-transit ridership were hypothetically transferred to passenger cars in Los Angeles, Chicago, and Manhattan. Recommendations are given for study of the underground-highway concept and developments of prototype machines capable of rapid excavation of vehicular tunnels under most rock conditions. (Author)

32. Miscellaneous Arts and Sciences

AD-607 467 Div. 32
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
AUTOMATIC INDEXING: AN EXPERIMENTAL INQUIRY.
Revised ed.,
by M. E. Maron. 2 Feb 61, 37p P-2180
Unclassified report

Revised edition of 1 September 1960. Prepared for presentation at the Third Institute on Information Storage and Retrieval at Washington, D. C. during the week of February 13-16, 1961.

Descriptors: (*Subject indexing, Automatic), (*Documentation, Classification), Experimental data, Statistical analysis, Probability, Libraries, Indexes, Tests, Information retrieval.

This inquiry examines a technique for automatically classifying (indexing) documents according to their subject content. The task, in essence, is to have a computing machine read a document and on the basis of the occurrence of selected clue words, decide to which of many subject categories the document in question belongs. This paper describes the design, execution and evaluation of a modest experimental study aimed at testing empirically one statistical technique for automatic indexing. (Author)

AD-607 584 Div. 32, 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
GOVERNMENT DECISION-MAKING AND THE THEORY OF CHOICE,
by A. Smithies. Oct 64, 12p P-2960
Unclassified report

Lecture given at RAND on 21 Jul 64, and revised with the benefit of discussion with A. Bergson, E. Domar, R. McKean, T. Rothenberg, and R. Zeckhauser.

Descriptors: (*Decision theory, Economics), (*Economics, Decision theory), United States Government, Armed force budgets, Distribution (Economics), Operations research, Military strategy.

The fundamental role of choices among alternative courses of action in government decision-making is demonstrated. The nature of decision-making is examined in terms of standard economic theory. The allocation of a given budget for defense is used as an illustration.

AD-607 673 Div. 32, 15
OTS Prices: HC $2.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SOME INVESTMENT CRITERIA FOR UNDERDEVELOPED AREAS,
by Harvey Averch. Feb 62, 32p P-2540
Unclassified report

Descriptors: (*Economics, Social sciences), (*Social sciences, Economics), Wages, Consumption, Mathematical models, Labor, Money, Industrial production, Statistical analysis, Matrix algebra, Equations.

The controversy existing in a growing economy with respect to alternative welfare criteria or targets is discussed. For example, in an economy with minimal current living standards (leaving aside problems of definition and measurement), is it better to raise current consumption and neglect any consequences for future income flow, or is it better to forego present consumption in favor of future income. Or, if an economy contains several sectors, what are optimal strategies of resource allocation with respect to present and future income. Clearly, deciding such questions implies the need for a social welfare function or a set of social welfare functions which contain the usual innate logical difficulties. Mathematical models are presented in support of this theory.

AD-607 674 Div. 32
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
SEEKING SOCIAL WELFARE FACTS IN A CALIFORNIA COUNTY: SACRAMENTO,
by Vaughn D. Bornet. Dec 61, 15p P-2494
Unclassified report

Descriptors: (*Social sciences, California), (*California, Social sciences), Public opinion, Population, Statistical data, United States government, Costs, Symposia.

An address to the Citizens' Welfare Advisory Committee of Sacramento County is presented. The Committee's responsibility was to review all welfare programs and administration of those programs, especially as to (1) aims and purposes of welfare legislation, (2) administrative problems of the county department, (3) formulation of recommendations to the Legislature and Congress, and (4) planning of steps which could be taken locally to promote assistance to those who were entitled to it and to deny aid to those who were not entitled to it.

AD-607 675 Div. 32, 18
OTS Prices: HC $1.00/MF $0.50

RAND Corp., Santa Monica, Calif.
POLITICAL CONTROL IN THE EAST GERMAN PEOPLE'S ARMY.
15 Dec 58, 12p T-108
TT 64 71626
Unclassified report

Trans. from Wehrkunde (West Germany) 1958, Nov.

Descriptors: (*East Germany, Army), (*Political science, USSR), Defense systems, Armed forces (Foreign), Control, Military personnel, Military training, Propaganda, Communism, Military organizations.

The political controls imposed on a Soviet satellite army are discussed. The article is of interest not only for the detail of information it offers but also because the East German 'National People's Army' at the moment is undoubtedly being readied for a role it may potentially play in the deepening German crisis. The elaborate network of controls and means of supervision is described in an armed force where suspicion and distrust rather than esprit de corps seem to be the outstanding morale factors.

AD-607 754 Div. 32, 5, 33
OTS Prices: HC $3.00/MF $0.75

RAND Corp., Santa Monica, Calif.
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NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk are included in the subject index.

1. Aircraft and Flight Equipment

AD-418 197 Div. 1, 14
OTS Prices: HC $2.00/MF $0.50

Shell Development Co., Emeryville, Calif.
STUDY OF HELICOPTER GEAR LUBRICATION.
Quarterly progress rept. no. 1, Jun-Aug 63,
by S. J. Beaubien, L. Lichtman, C. A. Converse, R. L. Jensen, and W. W. Kerlin. Aug 63, 38p Shell-S-13895
Contract NOw63 0557c

Unclassified report

Descriptors: (*Transmission gears, Helicopters), (*Lubrication, Transmission gears), (*Helicopters, Transmission gears), Stresses, Mathematical analysis, Load distribution, Lubricants, Tests, Simulation, Failure (Mechanics), Geometry, Life expectancy, Surface properties, Steel, Wear resistance.

The Hertz Stress for a known transmitted load for the tooth-to-tooth contact of spur gears can be evaluated simply for a contact point at the middle of the line of action. The Hertz stress for a known transmitted load at a contact point not at the middle of the line of action is simply related to that at the middle by a parameter X, which is the fractional distance of the contact point from the beginning of the line of action at the base circle of the driver. The occurrence of single tooth and double tooth contact can also be correlated by the parameter X. A typical helicopter gear oil, satisfying MIL-L-7808-C specification has exhibited a load carrying capacity of about 500 lb on a 0.1 inch face width. The life of a pair of test gears running with the above oil at constant load in the neighborhood of the load carrying capacity has a life of from one minute to eight hours, depending on the load. An increase in transmitted load of about 20 lb is sufficient to decrease the life by a factor of two. The pinion addendum, which is generally used to rate the oil and assign the load carrying capacity usually scores later than the gear addendum. This is probably due to gear tooth deflection under load. Pitting of helicopter gears and of the laboratory test gears has been observed, and it appears to be initiated at points of surface roughness.

PB-166 350 Div. 1
OTS Prices: HC $2.00/MF $0.50

Army Board for Aviation Accident Research, Fort Rucker, Ala.
ROLE OF PILOT FACTORS IN ARMY HELICOPTER ACCIDENTS,
by Emil Spezia. Jan 63, 28p
ABACR HF2 62

Unclassified report

Descriptors: (*Pilots, Aviation accidents), (*Helicopters, Aviation accidents), (*Aviation accidents, Helicopters), Aviation safety, Army personnel, Training, Flight.

In this statistical review of 1467 Army helicopter accidents occurring between July 1957 and December 1961, pilot factors are significantly consistent, having been reported in 72% of all accidents. Pilot factors alone in these accidents have been responsible for 28% of all accidents. Accidents of this category occurred at a rate of 13.2/100,000 hours flown in 1958-1959 and increased to the rate of 22.9/100,000 hours during the 1960-1961 period. In contrast within this same time frame the overall accident rate decreased 1.0/100,000 hours. Fifteen pilot factors that show a frequency increase have been identified with the increase of 117 pilot-caused accidents of the 1960-1961 period. Six factors in the order listed below reflected the greatest increase in frequency: (1) Improper use of light controls; (2) Misjudged distance, altitude or position; (3) Improper level off; (4) Failure to see aircraft or object; (5) Misuse of power plant controls; (6) Failed to maintain flying speed.

2. Astronomy, Geophysics and Geography

AD-259 108 Div. 2, 8
OTS Prices: HC $2.00/MF $0.50

United Research Inc., Cambridge, Mass.
TURBULENCE MEASUREMENTS AT HIGH ALTITUDES BY SECOND-DIFFERENCE INTERFEROMETRY.
Quarterly rept. no. 3, 1 Jan-31 Mar 61,
by Dwight W. Batteau and Newton S. Lichtblau.
31 Mar 61, 38p
Contract DA36 039sc84963

Unclassified report

See also PB-156 997.

Descriptors: (*Atmospheric motion, Measurement), (*Turbulence, High altitude), (*Radio interferometers, Meteorological instruments), (*Meteorological instruments, Radio interferometers), Radar targets, Radar tracking, Radar equipment, Phase detectors, Data processing systems.

A brief objective of the project and a current status report are given. Two methods are given for analyzing data obtained from the radar coordinate system. Method I gives a functional relation between a coordinate difference of two targets and their separation, and is given for theoretical interest, and because it provides a convenient independent check on the information obtained from Method II. The second method gives a procedure for obtaining complete information from the data furnished by a single radar array. The system for processing the data from the output of the receivers, particularly the techniques for comparing the phase differences, are descussed in detail. A series of experiments, designed to check out the system performance are discussed. Modifications made to the radar receiving system are described. (Author)

AD-409 031 Div. 2, 6, 30
OTS Prices: HC $7.50/MF $2.00

Massachusetts Inst. of Tech., Cambridge.
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607 984	14
607 985	8
607 986	8
607 987	5
607 988	8
607 989	8
607 990	25

Armco steel 15-7 Ph Mo, and copper corroded less than 5 mils; 410 stainless steel less than 70 mils; aluminum 1100, 6061, titanium A100AT and C120AV less than 300 mils; magnesium AZ31 less than 350; and magnesium A1C31 less than 700 mils. Data are given for corrosion of metals in gaseous fluorine at various temperatures. (Author)

5. Communications

AD-424 928 Div. 5, 25
OTS Prices: HC $4.00/MF $0.75

Technical Operations, Inc., Burlington, Mass.
INVESTIGATION OF COHERENT OPTICAL PROPAGATION,
by Thomas J. Skinner. Nov 63, 116p
Contract AF30 602 2619, Proj. 4519, Task 451905
RADC TDR63 217; N64 13426

Unclassified report

Descriptors: (*Coherent scattering, Light), (*Light communication systems, Space communication systems), (*Space communication systems, Light communication systems), Light, Propagation, Optical analysis, Lasers, Communication systems, Electromagnetic fields, Quantum mechanics.

This report includes:
App. 1. Diffraction of Partially Coherent Light by a Plane Aperture, by G. B. Parrent, Jr. and T. J. Skinner.
App. 2. Quantum-Mechanical Correlation Theory of Electromagnetic Fields, by J. Sarfatt, pub. in Il Nuovo Cimento, 1963, Mar. 1, v.XXVII, no. 5, p. 1-11.
App. 3. On the Mutual Coherent Function in an Inhomogeneous Medium, by George B. Parrent, Jr., Robert A. Shore, and Thomas J. Skinner, pub. in Journal of Mathematical Physics, 1962, Jul-Aug, v. 3, no. 4, p. 678-684.

6. Detection

PB-166 280 Div. 6
OTS Prices: HC $6.00/MF $1.25

Office of Scientific Research and Development. Div. 6.
UNDERWATER SOUND EQUIPMENT IV: FREQUENCY-MODULATED SONAR SYSTEMS.
Summary technical rept., vol. 17,
ed. by F. N. D. Kurie. 1946, declassified 2 Aug 60,
242p STR-6-17
AD 221 593

Unclassified report

Descriptors: (*Underwater sound equipment, Sonar), (*Sonar signals, Frequency modulation), Echo ranging, Underwater objects, Sonar equipment, Transducers, Circuits, Design, Operation.

Frequency modulated sonar, a continuously-radiated sound system for locating underwater objects is discussed. The history and development of the system is presented, including transducer and associated devices development.

PB-166 314 Div. 6
OTS Prices: HC $8.95/MF $2.50

Office of Scientific Research and Development. Div. 6.
UNDERWATER SOUND EQUIPMENT III: SCANNING SONAR SYSTEMS.
Summary technical rept., vol. 16,
1946, declassified 2 Aug 60, 594p STR-6-16
AD 214 253

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Underwater sound equipment, Scanning sonar), (*Scanning sonar, Underwater sound equipment), Echo ranging, Undersea warfare, Sonar equipment, Noise, Background, Display systems, Sonar signals, Circuits, Design, Operation.

This report covers progress made in the development of scanning sonar. General considerations and performance, test methods and techniques, and theory of scanning sonar is presented. Different types of this sonar system are discussed. The report concludes with a discussion of scanning sonar problems.

PB-166 328 Div. 6, 18, 22
OTS Prices: HC $5.00/MF $1.00

Research Analysis Corp., McLean, Va.
PROJECT PINPOINT: DISCLOSURE OF ANTITANK WEAPONS TO OVERWATCHING TANKS.
Technical memo.,
by John P. Young, Andrew J. Eckles, Norman W. Parsons, and Leighton F. Koehler. Jan 58, declassified 31 Aug 61,
158p RAC-T-362
Contract DA44 188ARO1
AD 222 514

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Antitank guns, Target acquisition), (*Target acquisition, Antitank guns), (*Tanks(Combat vehicles), Target acquisition), Warfare, Military tactics, Operations research, Ordnance.

In any tank-antitank battle the target must be located specifically before a tank crew is able to return effective fire. Project PINPOINT was a field experiment conducted to obtain information related to this problem of target acquisition by tanks in an overwatching role. Target acquisition was examined in terms of the probability of locating a target, the time required to locate a target, and the accuracy with which a target can be located. Various factors such as range, angle, weapon type, and number of rounds fired were investigated as to their effects on target acquisition in general and on probability time and accuracy in particular. (Author)

7. Electrical Equipment

AD-289 294 Div. 7, 4
OTS Prices: HC $6.00/MF $1.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
SOLAR REGENERATIVE CHEMICAL SYSTEM.
Rept. no. 7 (Final), 4 Sep 59-30 Sep 62,
by L. B. Anderson, E. V. Ballou, and S. A. Greenberg.
30 Sep 62, 299p LMSC-2-52-62-2
Contract DA36 039sc85245, ARPA Order nos 80-59, 80 61

Unclassified report

WITH APPLICATIONS TO PREDICTION AND DETECTION.
Scientific rept. no. 6,
by James Nelson Galbraith, Jr. May 63, 446p
Contract AF19 604 7378, Proj. 8652, ARPA Order180 61,
Task 865203
AFCRL 63 673

Unclassified report

Doctoral thesis.

Descriptors: (*Microseisms, Statistical data), (*Detection, Underground explosions), (*Mathematical models, Microseisms), Nuclear explosions, Seismic waves, Simulation, Programming (Computers), Statistical analysis, Series, Time, Stochastic processes, Correlation techniques, Signal-to-noise ratio, Band-pass filters, Computers.

Computational experiments have been performed on seismic data digitized from the records obtained by the Air force during the Logan and Blanca underground nuclear shots, by Dr. Bruce Bogert in New Jersey and by the Wichita Mountain Seismic Observatory. The experiments indicate that microseismic noise of about .3 cps frequency is associated with the oceans but the higher frequencies are not. Attempts to identify definite wave types, such as Rayleigh and Love waves, and to follow wave packets from station to station failed, but the failure illustrated the complexity of the microseisms and points out the necessity of a statistical study. For the statistical studies the microseisms were considered to be stochastic time series. It was found that the probability densities of the amplitudes were Gaussian and were not independent. Spectral analysis showed the typical microseism spectrum to have a maximum at about .3 cps and often other strong bands at 1.4 and 2 cps.

AD-443 977 Div. 2, 15
OTS Prices: HC $5.00/MF $1.00

United ElectroDynamics, Inc., Alexandria, Va.
SEISMOLOGICAL APPLICATIONS OF ORTHOGONAL FUNCTION EXPANSIONS.
Final rept.,
by Paul W. Broome and William C. Dean. 31 Jul 64, 174p
Contract AF49 638 1117, Proj. 8100, ARPA Order180 62, Task 2

Unclassified report

Rept. on Proj. Velva-Uniform.

Descriptors: (*Seismology, Numerical methods and procedures), (*Numerical methods and procedures, Seismology), (*Special functions (Mathematical), Seismology), Seismic waves, Propagation, Time, Signal-to-noise ratio, Mathematical analysis, Analog computers, Digital computers, Graphics, Spectroscopy.

A method is presented to represent very complicated transients by only a few numbers rather than by curves or by the set of coordinate values necessary to draw the curves. The representation used is an expansion in terms of a set of orthonormalized exponential functions. Procedures necessary to generate these functions, find the expansion coefficients, and use these coefficients in further analysis are described in detail. Two sets of procedures are developed, one which is exact for analog computations, and one which is exact for numerical calculations. It is shown that these procedures are easy to apply in practice. Section II of the report is concerned with sets of continuous orthonormal functions and is oriented toward analog computation. Section III is devoted to developing sets of orthonormal sequences. These are orthonormal functions which are defined on the set of integers and are used for numerical calculations using sampled data. Special emphasis is placed on the class of transients called teleseismic P-waves.

3. Chemical Warfare Equipment and Materials

No Entries

4. Chemistry

AD-292 080 Div. 4, 2, 25
OTS Prices: HC $1.00/MF $0.50

General Atomic Div., General Dynamics Corp., San Diego, Calif.
MEASUREMENTS OF ATMOSPHERIC ION REACTIONS.
Yearly technical summary rept. for 1 Apr 61-31 Jul 62,
by R. F. Stebbings. 31 Jul 62, 20p GA-3351
Contract DA49 146XZ041, Proj. 79
DASA 1330

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Gas ionization, Atmosphere), (*Atmosphere, Gas ionization), Reaction kinetics, Ionization, Nitrogen, Nitrogen compounds, Oxygen, Nuclear particles, Dissociation, Electron bombardment, Ion beams, Electrodes, Nuclear scattering, Gases, Laboratory equipment.

Contents:
Charge transfer in N2, O2, and NO; Oxygen atom source development; Charge transfer in atomic oxygen; and ion-molecule reaction studies.

AD-423 751 Div. 4
OTS Prices: HC $6.00/MF $1.25

Air Products and Chemicals, Inc., Allentown, Pa.
THE PROPERTIES AND HANDLING OF FLUORINE.
Rept. for 15 Oct 60-15 Oct. 61,
by S. Kleinberg, J. F. Tompkins, Jr., A. H. Singleton, and C. J. Sterner. Oct 63, 206p
Contract AF33 616 6515, Proj. 2, Task 7
ASD TDR62 273

Unclassified report

Descriptors: (*Fluorine, Chemical properties), (*Handling, Fluorine), Safety, Corrosion, Metals, Nickel alloys, Stainless steel, Copper alloys, Aluminum alloys, Titanium alloys, Carbon alloys, Magnesium alloys, Physical properties, Electromagnetic properties, Infrared spectroscopy, Chromatographic analysis, Cleaning, Chromium alloys, Copper, Safety, Compatibility.

This report presents data on properties of fluorine, methods of analysis, safe-handling procedures, compatibility of materials of construction with fluorine, corrosion rates of metals, and a bibliography of pertinent references. Special attention is given to the compatibility of materials in fluorine. Most metals are not severely corroded by pure fluorine. The presence of hydrogen fluoride (HF) in fluorine increases corrosion of metals markedly. The HF is usually generated in fluorine systems from the reaction of atmospheric moisture or moisture in the system with fluorine. Contaminants in fluorine other than HF do not present corcosion or safety problems. Cleanliness of a fluorine system is emphasized since contaminants may not be removed from the apparatus by passivation procedures. Most corrosion in a liquid fluorine system occurs during the first hour of exposure. When immersed in liquid fluorine for one year, nickel, Monel, 304 stainless steel,

15 Aug 61, 53p AIL-8412-1
Contract DA36 039sc85359, Proj. 3G19 06 001 03
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from best available copy.

Descriptors: (*Microwave amplifiers, C-band), Noise (Radio), Gain, Varactor diodes, Bandwidth, Silicon, Klystrons, Transistors, Radar equipment.

This report describes the development and construction of two C-band reactance amplifiers with a gain-bandwidth product greater than 600 Mc and a noise figure of less than 4 db at room temperature. Three different varactor diodes have been tested in various amplifier configurations at room temperature. An amplifier using a Bell Telephone Laboratory (BTL) point-contact gallium arsenide diode was tested under cooled conditions and an improvement in the noise figure was observed. It was impossible to obtain the required gain-bandwidth product in a single-diode amplifier without the use of double-tuning techniques. Consequently, the final design was based on a balanced configuration using two Microwave Associates (MA) silicon-pill diodes in a coaxial structure. The gain of both amplifiers was 20 db, and the bandwidth 70 Mc centered at 5280 Mc. The noise figure, including the circulator losses, was less than 4 db for both amplifiers.

AD-403 538 Div. 8, 6
OTS Prices: HC $3.00/MF $0.75

Sylvania Electric Products, Inc., Waltham, Mass.
RADAR INTERFERENCE STUDY.
Interim rept. for May 61-Nov 62,
by Walter B. Mills. Jan 63, 70p
Contract AF19 604 8484
ESD TDR63 221
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy. See also AD-602 709.

Descriptors: (*Radar interference, Scientific research), Radar, L band, Radar echo areas, Recording systems, Magnetic tape, Photographic techniques, High-speed photography, Doppler effect, Bandwidth, Radar pulses, Circuits, Atmospherics, Meteorological phenomena, Data.

This report covers a study of the electrical characteristics common to angel signal phenomenon encountered at L band radar sites. Photographic and magnetic tape storage techniques are used to record doppler frequency, doppler bandwidth, and pulse width information associated with these unknown signals. Data reduction results for a number of angel signal samples are tabulated and discussed. Two possible circuits to eliminate the angle interference from MTI portion of radar systems are described.

AD-418 719 Div. 8, 14, 25
OTS Prices: HC $4.00/MF $0.75

Philco Corp., Blue Bell, Pa.
METAL OXIDE AMPLIFIER.
Rept. no. 4 (Final), 15 May 62-15 May 63,
by James P. Spratt. 30 Jun 63, 122p
Contract DA36 039sc90715
Unclassified report

Descriptors: (*Semiconductor devices, Amplifiers), (*Transistor amplifiers, Materials), Zinc compounds, Cadmium compounds, Sulfides, Evaporation, Films, Gold, Thickness, Triodes, Gain, Tunnel diodes, Silicon compounds, Monoxides, Thermionic emission, Electrons, Phonons, Crystal lattices, Electron diffraction analysis.

Thin films of the ternary alloy ZnCdS were produced by evaporation of ZnS and CdS from separate sources. These films present a barrier height to metal films which depends on the composition of the alloy. By grading the composition of these films, asymmetric I-V curves indicative of Schottky barriers are obtained. The temperature dependence of these I-V curves is, however, not in accord with the simple theory. Active thin film triodes were built using ZnCdS alloys of graded composition for emmiter and collector barriers. These triodes have a current gain which depends on the thickness of the Au film separating the emitter and collector barrier layers. Frequency measurements of these devices show values for f sub T of 2 Mc. Attempts at producing tunnel emitters with Au-SiO-Au films were not successful due to the presence of pinholes in very thin SiO films and instability in thicker SiO films. (Author)

PB-163 965 Div. 8, 12
OTS Prices: HC $1.00/MF $0.50

Lockheed Microsystems Electronics, Sunnyvale, Calif.
SUBNETWORKS,
by P. S. Castro and W. W. Happ. 1961, 10p
LMSC-6-90-61-121
Unclassified report

Descriptors: (*Electronics, Networks), (*Networks, Electric terminals), Mathematical analysis, Matrix algebra, Theory, Design, Circuits.

A report on the logic governing the generation of subnetworks from multiterminal networks. The accomplishment of this process by associating with each permissible network operation a suitably defined set of reductions in rank of the indefinite (or equi-cofactor) matrix of the network. Criteria for uniqueness and non-redundancy of subnetworks are defined and applied to evaluate representative large networks in terms of properties associated with generated subnetworks.

PB-166 349 Div. 8
OTS Prices: HC $7.00/MF $1.75

General Dynamics/Electronics, Rochester, N. Y.
AUTOMATIC TEST EQUIPMENT STUDY.
Final engineering rept.
by W. Helf, W. Chandler, J. Keebler, A. Alphenaar, and R. Margeson. 1961 338p
Contract AF33 604 28541
AD 253 700
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Test equipment (Electronics), Automatic), Oscillators, Pulse generators, Resistors, Multimeters, Impedance bridges, Frequency meters, Time-interval counters, Pulse analyzers, Power supplies, Programming (Computers), Airborne, Electronic equipment, Maintenance, Costs.

This document covers work performed on a study program determining the requirements of Automatic Test Equipment for depot testing of Airborne Electronic Equipment. Fifteen (15) airborne electronic equipments normally serviced at the Dayton Air Force Depot (DAAFD) were selected as a representative cross section of the present and future requirements of the depot maintenance operation. These equipments were analyzed and a definition of Automatic Test Equipment required for depot operations was established. This definition of Automatic Test Equipment as designated by this report allows for growth and expansion of the depot operation as additional airborne electronic systems become a part of the overall repair inventory. This is accomplished by implementing a build-

We regret that legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Fuel cells, Solar radiation), (*Energy conversion, Fuel cells), (*Solar radiation, Energy conversion), Electrochemistry, Cadmium compounds, Lithium compounds, Lead compounds, Iodides, Mercury compounds, Bromides, Pyrolysis, Dissociation, Solar furnaces, Electrolysis, Photochemistry, Dyes, Ascorbic acid, Reaction kinetics, Photoelectric effect.

The research program was concerned with the development of regenerative fuel cells as devices for converting solar energy into electrical energy. Two approaches to the use of solar energy for regeneration were considered. One approach involves a chemical system in which the reactants consumed in an electrochemical fuel cell produce a product which can be decomposed upon heating to yield the original reactants. Heat could be supplied to this unit by utilizing a solar furnace of appropriate design. A second approach depends on the photochemical reversal of the fuel cell reactions. (Author)

AD-439 400 Div. 7, 4, 14, 17
OTS Prices: HC $3.00/MF $0.75

General Electric Co., Lynn, Mass.
MATERIALS OF CONSTRUCTION FOR HYDROCARBON-AIR FUEL CELLS WITH HOT CONCENTRATED PHOSPHORIC ACID ELECTROLYTE.
Interim rept. no. 1,
by P. V. Popat and A. Kuchar. 1 Apr 64, 60p
Contract DA44 009AMC479T, Proj. P4980;
ARPA Order 247
N64 21297
Unclassified report

Rept. on Saturated Hydrocarbon Fuel Cell Program.

Descriptors: (*Fuel cells, Materials), Phosphoric acids, Gold, Platinum, Tantalum, Palladium alloys, Silver alloys, Gold alloys, Chromium alloys, Tungsten alloys, Electrodes, Hydrogen, Carbon, Graphite, Halocarbon plastics, Hydrocarbons, Fuels, Electrochemistry.

The results of chemical and electrochemical corrosion studies of selected massive metals, alloys and carbons in 90 Wt. % phosphoric acid (C. P. grade) at elevated temperatures (150-175C) are presented. Also, the data for the behavior of selected plastics in the concentrated acid as well as in the typical hydrocarbon fuel, JP-4, at elevated temperatures are presented.

8. Electronics and Electronic Equipment

AD-256 279 Div. 8, 25
OTS Prices: HC $1.00/MF $0.50

Microwave Lab., Stanford Univ., Calif.
SOLID-STATE, TWO-LEVEL, HIGH-POWER MASER.
Quarterly progress rept. no. 5, 1 Dec 60-28 Feb 61.
Mar 61, 18p ML-799
Contract DA36 039sc85263, Proj. 3 99 00 000
Unclassified report

Descriptors: (*Masers, Radiofrequency generators), (*Radiofrequency generators, Masers), (*Ferrites, Radiofrequency generators), (*Solid state physics, Masers), K band, Pulse generators, Low-pass filters, Ferromagnetic materials, Magnetic fields, Dielectrics, Nuclear resonance, Microwaves, Microwave amplifiers, Feasibility studies.

Theoretical and experimental investigations of pulsed microwave generation without an rf input signal are continuing. Initial tests have been run on two models of the pulsed generator, using a disk-shaped sample without an rf input signal, without success. Measurements have been made on these devices which, it is believed, show reasons for the negative results. Changes are being made to correct these. Equations describing the motion of the magnetization in the disk-shaped sample under the influence of a transient magnetic field, whose amplitude and direction changes with time, have been programmed on an analog computer. The results should be directly applicable to the schemes now being tried experimentally. Development of components for a K-band, high-efficiency generator, using an X-band rf input signal, are continuing. The first model of a low-pass filter for this generator, using a nonlinear dielectric element, was tested. The results were favorable, showing a stop-band without spurious responses. The corona problem on the 100 kilogauss pulse field apparatus has received some attention and appears to have been corrected.

AD-263 610 Div. 8, 25
OTS Prices: HC $2.00/MF $0.50

Microwave Lab., Stanford Univ., Calif.
SOLID-STATE, TWO-LEVEL, HIGH-POWER MASER.
Quarterly progress rept. no. 6, 1 Mar-31 May 61.
Jun 61, 28p ML-824
Contract DA36 039sc85263, Proj. 3 99 00 000
Unclassified report

See also AD-263 610.

Descriptors: (*Masers, Radiofrequency generators), (*Radiofrequency generators, Masers), (*Ferrites, Radiofrequency generators), (*Solid state physics, Masers), K band, Pulse generators, Low-pass filters, Ferromagnetic materials, Magnetic fields, Dielectrics, Nuclear resonance, Microwaves, Microwave amplifiers, Single crystals, Garnet, Feasibility studies.

Experiments on pulsed microwave generation without an rf input signal are studied. Equations of motion for the magnetization in a ferrite disk in a transient magnetic field are set up on an analog computer. Initial solutions are obtained, but they do not cover the desired parameter ranges, due to computer limitations. Possibilities for using a more suitable computer are explored. Work on a low pass input filter for a K-band generator, using a nonlinear dielectric element, is continued. Measurements are made on a series of linear dielectric materials which were made to order for this project. The purpose is to decrease the insertion loss by using a linear element, together with a nonlinear element. Initial measurements are made of the properties of polycrystalline and single crystal garnet disk samples. It is found that the linewidth does not follow theoretical expectations. Also, distortion of the resonance line by magnetostatic modes is found to be significant. Methods for suppressing spin wave instability and thus increasing the power output of the existing ferrite generators are investigated. A possible new approach to this problem is proposed. Alternate approaches to pulsed ferrite generation utilizing the crystalline anisotropy field are studied.

AD-265 745 Div. 8, 25
OTS Prices: HC $3.00/MF $0.50

Airborne Instruments Lab., Inc., Deer Park, N. Y.
DEVELOPMENT OF C-BAND REACTANCE AMPLIFIER.
Final rept. for 14 Jun 60-15 Jun 61,
by J. C. Greene, J. Kliphuis, and J. J. Whelehan.

12. Guided Missiles

No Entries

13. Installations and Construction

No Entries

14. Materials (Non-Metallic)

AD-279 202 Div. 14, 2, 4
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
COLLECTION OF SLICK-FORMING MATERIALS FROM THE SEA.
Interim rept.,
by W. D. Garrett. 5 Mar 62, 14p
Proj. SF001 06 01, Task 1500
NRL 5761

Unclassified report

Descriptors: (*Seawater, Surface-active substances), (*Surface-active substances, Collecting methods), Films, Analysis, Absorption, Separation, Surface properties.

A method for the removal and isolation of the substances present in natural and man-made oceanic slicks was developed. The technique utilizes a plane metal wire screen which when drawn through a water surface removes discrete segments of the surface layer between the wires. In this manner, a 0.15-mm film of surface water containing all constituents of the surface film was taken from the sea. This approach was found to be effective regardless of the film pressure; hence, it may be applied to monclayers under low film compression. Certain solid adsorbers also appeared promising as surface film collection tools. However, this approach was discarded because of the difficulty encountered in desorbing the sick constituents from the adsorbers. (Author)

AD-291 216 Div. 14, 12
OTS Prices: HC $3.00/MF $0.75

Southwest Research Inst., San Antonio, Tex.
INVESTIGATION OF LUBRICANTS FOR SATELLITE AND SPACE VEHICLE INSTRUMENTATION.
Quarterly rept. no. 2, 1 Jul-30 Sep 62,
by R. D. Brown, R. A. Burton, and P. M. Ku.
29 Oct 62, 68p RS-362
Contract DA36 039SC89207

Unclassified report

See also AD-283 784.

Descriptors: (*Lubricants, Bearings), Lubrication, Friction, Wear resistance, Vacuum, Satellites (Artificial), Spacecraft, Instrumentation, Reviews.

The report describes the second three months' work on a program for the investigation of friction and wear in ultra-high vacuum. It is specifically directed toward the development of bearing-lubricant combinations that will be suitable for long-term application in an environment such as encountered by communication satellites. The results of six long-term sliding friction tests conducted in six small vacuum chambers at pressures in the 10 to the minus 9th power to 10 to the minus 7th power torr range are reported. These six tests comprise 20 pairs of sliding friction specimens. Test durations range from 40 to 120 days. Also reported are the results of six ball bearing tests conducted at pressures generally in the range of 10 to the minus 8th power to 10 to the minus 6th power torr. All the bearings were 204 size and were tested under light (1/2 lb) radial load. The bearings, run intermittently, were under test for periods of time up to 23 days. (Author)

AD-408 768 Div. 14, 12
OTS Prices: HC $3.00/MF $0.75

Southwest Research Inst., San Antonio, Tex.
INVESTIGATION OF LUBRICANTS FOR SATELLITE AND SPACE VEHICLE INSTRUMENTATION.
Final rept. for 1 Apr 62-31 Mar 63,
by R. D. Brown, R. A. Burton, and P. M. Ku.
30 Apr 63, 94p RS-376
Contract DA36 039SC89207

Unclassified report

See also AD-297 972.

Descriptors: (*Lubricants, Bearings), Lubrication, Friction, Vacuum, Wear resistance, Satellites (Artificial), Spacecraft, Instrumentation, Materials, Tests.

The report describes the results of a program for the investigation of sliding friction and ball bearings in very high vacuum. It was specifically directed toward the development of bearing-lubricant combinations that will be suitable for long-term application in an environment such as encountered by communication satellites. The friction of slider and bearing systems, enclosed separately in individual ion-pumped envelopes, was evaluated during periods of up to 270 days' exposure to vacuums generally in the range of 10 to the minus 9th power to 10 to the minus 7th power torr. Most of the tests were performed at room temperature, but a limited number of friction measurements were made at temperatures ranging from -320 to 300F. In both sliding friction and bearing tests, results indicate that low levels of friction-mitigating contaminant remain for long periods in vacuum. The presence of contaminant films was evidenced by measurable pressure rises that resulted whenever surface rubbing occurred.

15. Mathematics

No Entries

16. Medical Sciences

PB-166 348 Div. 16, 29
OTS Prices: HC $4.00/MF $0.75

Utah State Univ., Logan.
STUDIES IN RADIATION PRESERVATION OF FRUIT AND VEGETABLE PRODUCTS.
Rept. no. 6 (Annual) for 1 Dec 56-30 Nov 57,
by L. H. Pollard and D. K. Salunkhe. 30 Nov 57, 112p
Contract DA19 129QM821, Proj. 7 84 01 002
DSSC S545; AD 161 492

Unclassified report

ing block concept and philosophy. A logical breakup of the building blocks into the various categories was accomplished and the results are presented in this report. The forty-three building blocks required for the 15 equipments studied are defined by brief performance specifications. (Author)

9. Fluid Mechanics

AD-434 473 Div. 9, 30
OTS Prices: HC $2.00/MF $0.50

Virginia Univ., Charlottesville.
DETERMINATION OF THE SOLID PHASE VELOCITY IN A TURBULENT GAS-SOLIDS PIPE FLOW.
Technical rept.,
by R. Eichhorn, R. Shanny, and U. Navon. Mar 64, 48p
PR-107-P
Contract Nonr3623 00, Proj. NR098 038
N64 19635

Unclassified report

Subcontracted to Princeton Univ., N. J.
Legibility of this document is in part unsatisfactory.
Reproduction has been made from best available copy.

Descriptors: (*Fluid mechanics, Flowmeters), (*Flowmeters, Airfoils), Turbulence, Fluid flow, Gases, Solids, Mixtures, Pipes, Measurement, Fiber optics, Instrumentation.

A description is given of the development of a new type of probe, employing optical fibres, for the determination of the velocity of solid particles in a two phase gas-solids flow. The application of this probe to a turbulent pipe flow, comprising a suspension of 200 micron glass beads in air, yielded the distribution function for the longitudinal velocity as well as the mean velocity, mass flux and concentration profiles. Results are reported for measurements made at two separate axial locations for single values of the Reynolds number and mass flux ratio. (Author)

PB-166 346 Div. 9, 22
OTS Prices: HC $1.00/MF $0.50

David Taylor Model Basin, Washington, D. C.
CRITICAL PRESSURES FOR THE INCEPTION OF CAVITATION IN A LARGE-SCALE NUMACHI NOZZLE AS INFLUENCED BY THE AIR CONTENT OF THE WATER,
by S. F. Crump. Jul 51, 24p
Proj. NS713 065
DTMB 770

Unclassified report

Descriptors: (*Convergent divergent nozzles, Cavitation), (*Cavitation, Convergent divergent nozzles), Pressure, Air, Water, Diffusers, Model tests, Water tunnels, Fluid flow, Reynolds number, Vortices, Velocity, Statistical distributions, Fluid dynamic properties.

A 12-scale model of a Numachi Nozzle 22, a venturi-type nozzle with an abrupt diffuser, was tested to determine the critical pressures for the inception of cavitation as a function of the air content of the water. The test results are compared with those of Numachi. Although the absolute values of the critical pressures for cavitation inception do not agree in the two investigations, the same general trends were observed. It is believed that the observed differences are due to vortex formation in the diffuser and Reynolds-number effects. (Author)

10. Fuels and Combustion

PB-166 291-1 Div. 10, 26, 30
OTS Prices: HC $2.00/MF $0.50

Virginia Polytechnic Inst., Blacksburg.
OPTIMIZATION OF UNDERGROUND MINING. VOLUME I, A NEW COST-REDUCTION TOOL FOR THE COAL INDUSTRY.
Final rept. vol. 1, Apr 62-Jun 64,
by L. J. Prelaz, P. T. Sironko, E. P. Bucklen, and J. Richard Lucas. 24 Aug 64, 36p
Contract 14 01 0001 226
OCR RDR6 V1

Unclassified report

Descriptors: (*Mining engineering, Optimization), (*Management engineering, Programming (Computers)), Coal, Industrial production, Costs, Reduction, Systems engineering, Training.

Computer programs are used to evaluate production problems in the coal industry.

PB-166 291-2 Div. 10, 26, 30
OTS Prices: HC $7.15/MF $1.25

Virginia Polytechnic Inst., Blacksburg.
OPTIMIZATION OF UNDERGROUND MINING. VOLUME II, TECHNICAL REPORT.
Final rept. vol 2, Apr 62-Jun 64,
by L. J. Prelaz, P. T. Sironko, E. P. Bucklen, and J. Richard Lucas. 24 Aug 64, 412p
Contract 14 01 0001 226
OCR RDR6 V2

Unclassified report

Descriptors: (*Mining engineering, Optimization), Systems engineering, Simulation, Mathematical models, Programming (Computers), Input-output devices, Operations research, Industrial production, Transportation, Costs, Inventory, Time, Coal.

Topics include: summary of the technical report; simulation of face mining systems; mathematical-model applications in mining systems; computation of operating-supply usage in mining systems.

PB-166 291-3 Div. 10, 26, 30
OTS Prices: HC $5.00/MF $1.00

Virginia Polytechnic Inst., Blacksburg.
OPTIMIZATION OF UNDERGROUND MINING. VOLUME III, COLLECTING MINING DATA.
Final rept. vol. 3, Apr 62-Jun 64,
by L. J. Prelaz, P. T. Sironko, E. P. Bucklen, and J. Richard Lucas. 24 Aug 64, 186p
Contract 14 01 0001 226
OCR RDR6 V3

Unclassified report

Descriptors: (*Mining engineering, Optimization), (*Time studies, Industrial production), Costs, Coal, Systems engineering, Programming (Computers), Data, Machines, Transportation, Operations research, Collecting methods.

11. Ground Transportation Equipment

No Entries

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Powder alloys, Dispersion hardening), (*Copper alloys, Dispersion hardening), (*Dispersion hardening, Copper alloys), Oxides, Aluminum compounds, Powder alloys, Metals, Bonding, Mechanical properties, Grain structures (Metallurgy), Phase studies, Refractory materials, Microstructure, Impurities, Grain boundaries, Copper.

From experimental results the following conclusions can be drawn: Incorporation of dispersions of particulate alumina in copper provides a means for strengthening to a degree which cannot be entirely attributed to the copper matrix of fine grain size. Although fine grain sizes obtainable from powder metal products of this type (SAP type alloys) are an important factor, the disperse phase adds considerably in itself to the strength of the alloy. Optimum resistence to plastic deformation for the system investigated is best produced when conditions for bonding exist between particles and matrix. The strength of extruded copper-alumina alloys can be separated into individual contributions from matrix grain size, solid solution impurities, and from the disperse phase.

18. Military Sciences and Operations

AD-266 888 Div. 18, 30
OTS Prices: HC $4.00/MF $0.75

Research Analysis Corp., McLean, Va.
COMPUTER-ASSISTED STRATEGIC LOGISTIC PLANNING: TRANSPORTATION PHASE,
by Martin W. Brossman, Robert G. Busacker, Ralph A. Hafner, M. Wanda Porterfield, and Strother H. Walker.
Jul 61, 134p RAC-T-393
Contracts DA44 188ARO1 and DA44 109qm266
Unclassified report

Descriptors: (*Logistics, Programming (Computers)), (*Armed forces transportation, Programming (Computers)), Control sequences, Time studies, Feasibility studies, Simulations, Game theory, Military requirements, Test methods.

1. The feasibility of computer-assisted transportation planning at the strategic level has been demonstrated. 2. The computer-assisted procedure developed in this study gives TC the capability: (a) To reduce by a factor of 2 or 3 the time required to complete the T Annex to a DASL (subject, of course, to total elapsed time determined by procedures of other technical services). (b) To increase the military soundness of strategic transportation plans without increasing total expenditure of effort on the part of planners. (c) To respond quickly to changes in guidance. (d) To test the effects of differing assumptions by repeated trials within planning deadlines. (e) To consider alternative courses of action in a single plan. 3. The feasibility of computer-assisted planning in the other technical service areas is strongly indicated and ought to be tested. 4. The feasibility of computer-assisted contingency and operational planning is indicated and ought to be tested. 5. Computer-assisted procedures appear to have the potential, in general, for increasing accuracy and scope of plans and reducing planning time; when feasibility has been sufficiently demonstrated, these methods should be exploited by the US military services as rapidly as possible since they promise to contribute to a substantial improvement in readiness position.

AD-412 899 Div. 18, 30
OTS Prices: HC $2.00/MF $0.50

Mitre Corp., Bedford, Mass.
EXPERIMENTAL AIR TRANSPORT PLANNING FACILITY.
Preliminary rept.
Jun 63, 42p Mitre-SR-71
Contract AF33 600 39852, Proj. 473
ESD TDR63 268
Unclassified report

Descriptors: (*Command and control systems, Air Force), (*Air transportation, Command and Control systems), (*Programming (Computers), Air transportation), Armed forces (United States), Mobilization, Tactical air command, Experimental data, Armed forces operations, Data, Logistics, Data processing systems.

This document describes the experimental air transport planning facility under development at The MITRE Corporation. This facility provides a test bed for investigation of appropriate data processing aids in planning transport operations. Current capabilities allow the planner to determine the number of missions necessary to transport a load of cargo and passengers from onload to offload bases. Future uses will include aids to aircraft allocation, scheduling and generation of base support requirements. (Author)

PB-166 340 Div. 18, 15, 26
OTS Prices: HC $6.00/MF $1.50

United Research, Inc., Cambridge, Mass.
TRANSPORTATION-INVENTORY TRADE-OFFS. PHASE B: DECISION MODELS FOR SUPPLY SYSTEM OPERATIONS.
Sep 60, 284p
Contract Nonr2904 00
AD 252 155
Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Armed forces supplies, Scheduling), (*Scheduling, Mathematical models), (*Logistics, Mathematical models), Navy procurement, Procurement, Transportation, Distribution, Costs, Operations research, Inventory, Probability, Statistical distributions, Decision theory, Equations, Functions, Optimization.

This study develops several general models that may provide a basis for practical decisions concerning the operation of the Navy Supply System, involving the fields of procurement, allocation, and redistribution. The main emphasis has been placed on system transportation costs.

19. Navigation

No Entries

20. Nuclear Physics and Nuclear Chemistry

AD-279 855 Div. 20, 8
OTS Prices: HC $1.00/MF $0.50

Naval Research Lab., Washington, D. C.
A TRANSISTORIZED MAGNET CURRENT AMPLIFIER FOR A REACTOR CONTROL SYSTEM.

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Food, Radiation effects), (*Irradiated foods, Preservation), Fruits, Vegetables, Radiological dosage, Microbiology, Containers, Packaging, Gamma rays, Armed forces supplies.

Fruits and vegetables of prime quality and as far as possible of uniform maturity were selected for the experiments. Some of the samples were cushioned within a can lining material such as a polyethylene bag; other samples were included without such lining and a cushioning material prior to sealing them in No. 10 tin cans. Representative cans were sealed under vacuum; other cans were sealed without vacuum. Some of the cans for certain treatments were perforated after sealing. Each can was labeled indication the dose, rate, and temperature of gamma rays to be given. Subsequent to irradiation, the cans were returned to the research laboratories where the irradiated products along with the non-irradiated control products were evaluated for quality appraisal as well as for certain microbiological and physio-chemical changes immediately after irradiation, and after storing the irradiated products at different lengths of time and temperatures. Quality of the irradiated fruits and vegetables was evaluated by a trained panel consisting of 10 judges.

17. Metallurgy

AD-413 926 Div. 17, 26
OTS Prices: HC $4.00/MF $0.75

Du Pont Metals Center, (E.I.), Du Pont de Nemours and Co., Inc., Baltimore, Md.
COLUMBIUM ALLOY EXTRUSION PROGRAM.
Final rept. for 15 Mar 60-16 Jan 62,
by James S. Clark and Arthur W. Dana, Jr.
Jun 63, 118p
Contract AF33 600 40700, Proj. 7-775
ASD TDR63 637 V1

Unclassified report

Descriptors: (*Refractory metals and alloys, Material forming), (*Niobium alloys, Extrusion), (*Extrusion, Niobium alloys), Titanium alloys, Molybdenum alloys, Carbon alloys, Melting, Dies, Design, Lubrication, Glass, Metallography, Tensile properties, Stresses, Rupture, Microstructure, Tungsten alloys, Zirconium alloys, Vanadium alloys, Ceramic coatings, Tantalum alloys.

A manufacturing process was developed for producing D-31 alloy (Cb-10Ti-10Mo-.1C) 'T' sections, 2 in x 1.250 in x 0.250, for structural applications in aerospace vehicle systems. The program encompassed a state-of-the-art survey, the preparation and evaluation of billet stock, the development of the 'T' extrusion process and post-extrusion conditioning techniques, and finally an evaluation of the quality, structure, and mechanical properties of the 'T' sections. Sections meeting program goals for dimensions, surface finish, and length were produced by extrusion from 3200F through ceramic-coated cone dies. Wrought, uniform billet stock was produced by melting 8-inch diameter ingots and converting to 4-inch diameter rounds by warm extrusion. The process and an evaluation of the billet stock are described. Thirty-seven 'T' extrusions were made in developing the process. The investigation of die design and construction and lubrication practice are described. Satisfactory as-extruded surface finish was achieved through die development and refinement of the glass lubrication practice. (Author)

AD-420 581 Div. 17
OTS Prices: HC $5.00/MF $1.00

Redstone Scientific Information Center, Redstone Arsenal, Ala.
LITHIUM, FIELDS OF KNOWN AND POSSIBLE APPLICATION,
by Boris Iosifovich Kogan. 1 Oct 63, 162p
RSIC 71; TT 63 24052

Unclassified report

Trans. of mono. Litii; Oblasti Osvoennogo i Vozmozhnogo Primeneniya, Moscow, 1960, 110p.

Descriptors: (*Lithium, Industries), Lithium compounds, Lithium alloys, Isotopes, Industrial production, Chemical properties, Physical properties, Ores (Metal sources), USSR.

From the time of its discovery (1817) to approximately 1947, i.e. for 130 years, lithium remained a quite unremarkable element. The regions of its application were limited and not urgent, and its mining was extremely negligible. Some animation in the lithium industry was observed only during the years of the First World War and during the period of the Second World War. This situation has changed radically in the last decade, in view of the fact that lithium has begun to find use in thermonuclear processes, and its consumption in the glass and ceramic industry, in the production of lubricating materials, and in a number of other branches of modern technology, has begun to increase. The use of lithium and tritium produced from the isotope Li(6) in thermonuclear processes has produced a sudden growth of the lithium industry; in the United States its development was stimulated to a considerable degree at the insistence of military organizations and the Atomic Energy Commission.

PB-166 276 Div. 17, 25
OTS Prices: HC $1.00/MF $0.50

Illinois Univ., Urbana.
PROGRESS REPORT ON MECHANISMS OF DUCTILITY AND FRACTURE
by Patricia Bunn, Emanuel deLamotte, Ronald Gibala, Robert Hoffman, and Charles Wert. 31 Jan 63, 6p
Contract AF33 616 6176

Unclassified report

Descriptors: (*Crystal lattice defects, Metals), (*Alloys, Mechanical properties), (*Refractory metal alloys, Crystal lattice defects), Metals, Ductility, Fracture (Mechanics), Impurities, Niobium alloys, Boron alloys, Tantalum alloys, Oxygen, Nitrogen, Crystal structure, Anisotropy, Vanadium alloys, Refractory metals, Thermodynamics, Solid solutions.

A study was made of the effect of the interactions of dislocations with small impurity atoms, C, N and O on the mechanical properties of body-centered cubic metals.

PB-166 347 Div. 17
OTS Prices: HC $2.00/MF $0.50

IIT Research Inst., Chicago, Ill.
THE MECHANISM OF STRENGTHENING IN METALS CONTAINING AN OXIDE DISPERSION.
Final rept. for 1 Jul 58-1 Jul 59,
by Robert L. Hodson, Robert H. Read, and Arthur G. Metcalfe. 27 Jul 59, 46p IITRI-2149-4
Contract DA11 022ORD2770, Projs. DA5B99 01 004, TB2 0001
AROD 2037 1; AD 226 741

Unclassified report

23. Personnel and Training

No Entries

24. Photography and Other Reproduction Processes

AD-430 004 Div. 24
OTS Prices: HC $5.00/MF $1.50

Xerox Corp., Rochester, N. Y.
CAMERA-SPEED XEROGRAPHIC PLATE.
Final rept. for 1 Oct 62-30 Sep 63,
by M. Smith. 30 Sep 63, 154p
Contract NOw63 0104c

Unclassified report

Descriptors: (*Photographic plates, High-speed photography), (*High-speed photography, Electrophotography), (*Electrophotography, Photographic plates), Cadmium compounds, Sulfides, Sintering, Photographic films, Powders, Photoconductivity, Impregnation, Epoxy plastics, Coatings, Selenium, Binders, Styrene plastics, Plastics, Photographic images.

Sintered CdS films were prepared with various contacts, and comparison studies were made under both steady-state and pulsed-light conditions. Photoconductivity growth and decay curves were studied as a function of previous exposure history, light intensity, light wavelength, and bias lighting of various wavelengths. Attempts were made to improve the performance of the sintered films via overcoating of the films with evaporated CdS, impregnation with an epoxy resin, impregnation with selenium and by sintering under pressure. Binder layers of photoconductive CdS powder in the various binder materials, polystyrene, epoxy and Lucite were studied as a function of the method of preparation, the binder concentration and the layer thickness. The resolution characteristics of both sintered and binder plates were studied via the xerographic mode and cascade development. The plates were also examined in the proposed over-all imaging system utilizing Frost development, and it was demonstrated that images could be obtained with the binder plates.

PB-166 262 Div. 24
OTS Prices: HC $2.00/MF $0.50

Institute of Optics, Univ. of Rochester, N. Y.
A LIMIT ON THE ACCURACY OF PHOTOGRAPHIC PHOTOMETRY,
by James A. Eyer. 5 Feb 59, 38p
Contract Nonr1799 10
DASA 1112; AD 211 648

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction will be made from best available copy.

Descriptors: (*Photographic grain, Spectroscopy), (*Spectroscopy, Photographic grain), Photography, Photometers, Photographic emulsions, Photographic film, Density, Measurement, Equations, Probability.

The granular nature of the photographic emulsion limits the accuracy with which the density of a small area on the film can be defined. The consequences of this fact are examined with reference to the limiting accuracy which can be expected when a spectrograph is employed for photometric measurements. The quantity of information conveyed by a single density measurement is calculated for a particular emulsion and microdensitometer scanning aperture. (Author)

25. Physics

AD-285 947 Div. 25
OTS Prices: HC $1.00/MF $0.50

Bell Telephone Labs., Inc., Murray Hill, N. J.
OPTICAL MASER RESEARCH.
Quarterly rept. no. 4, 15 Apr-15 Jul 62,
by J. G. Skinner, J. E. Geusic, and J. A. Koningstein.
15 Jul 62, 16p
Contract DA36 039sc87340, Proj. 3A99 21 001

Unclassified report

Prepared on behalf of Western Electric Co., New York.

Descriptors: (*Lasers, Ruby), (*Masers, Optics), (*Optics, Masers), Diffraction, Crystal oscillators, Absorption spectrum, Yttrium compounds, Aluminum, Garnet, Interferometers, Rare earth elements, Impurities, Erbium.

Research on optical masers and the exploration of possible optical maser devices are the principal objectives of the report. The first part of the report discusses work on a mode selective interferometer for the purpose of obtaining optical oscillators of large diameter which have diffraction-limited beams. The experimental results on a pulsed ruby optical oscillator using this interferometer are presented. The spectroscopic study of Yttrium Aluminum Garnet doped with rare earths has continued. In Part II of the report, the spectrum of Er(3+) in YtA Garnet is discussed. Also an energy level scheme for Er(3+) in YtA Garnet, which has been inferred from the experimental data, is presented. (Author)

AD-290 259 Div. 25, 2, 4
OTS Prices: HC $3.00/MF $0.75

Naval Research Lab., Washington, D. C.
STARK BROADENING OF HYDROGEN AND HYDROGENIC NEUTRAL AND IONIZED HELIUM LINES IN A PLASMA,
by H. R. Griem, A. C. Kolb, and K. Y. Shen.
3 Aug 62, 74p
Proj. RR002 10 45 5054
NRL 5805

Unclassified report

Descriptors: (*Plasma medium, Line spectrum), Hydrogen, Helium, Ions, Electrons, Field theory, Tables.

The frequency distributions of hydrogen, ionized helium, and hydrogenlike neutral helium lines broadened by the local fields of both ions and electrons in a plasma are calculated in the classical path approximation. The electron collisions are treated by an impact theory which takes into account the Stark splitting caused by quasi-static ion fields. The ion field strength distributions used include the effect of electron shielding and ion-ion correlations. The various approximations employed are examined for self-consistency, and an accuracy of about 10% in the resulting line profiles is expected, except on the far wings of the lines. An extensive set of Stark profiles is presented graphically. All profiles are also tabulated. (Author)

AD-416 659 Div. 25, 4
OTS Prices: HC $4.00/MF $0.75

Electro-Optical Systems, Inc., Pasadena, Calif.
RESEARCH ON ORGANIC COHERENT ELECTROMAGNETIC RADIATION MATERIALS.
Final rept. for 15 Jun 62-15 Jun 63,
by L. Nugent, S. Lee, J. Burns, and R. Stephens.
Aug 63, 119p EOS-3180
Contract AF33 657 9395, Proj. 5237, Task 523701
ASD TDR63 685

Unclassified report

Final rept.,
by W. D. Whitehead. 27 Mar 62, 8p
Proj. RR010 01 44 5855
NRL 5763

Unclassified report

Descriptors: (*Current amplifiers, Nuclear reactors), (*Reactor safety systems, Current amplifiers), (*Nuclear reactors, Control systems), Transistors, Magnetic amplifiers, Electromagnets, Couplings, Voltage, Safety devices, Neutron absorbers, Reactor fuel rods, Underwater.

A transistorized magnet current amplifier was developed for use in the control system of the NRL pool reactor. Its use has alleviated some of the conditions which have led to electrical failures in the electromagnets employed as coupling devices between the reactor safety rods and their drives. The circuit was designed so that no modifications were required to other components in the control system. The input of the amplifier is connected to a Sigma bus which brings together at a common electrical point the outputs of six safety amplifiers. If the output of any one safety amplifier indicates an unsafe condition by deviating above or below a normal output voltage, magnet current will be reduced enough to cause the safety rod to drop back into the core. (Author)

21. Nuclear Propulsion

No Entries

22. Ordnance

AD-417 919 Div. 22
OTS Prices: HC $2.00/MF $0.50

Bureau of Mines, Pittsburgh, Pa.
INITIATION OF DETONATION BY LOW AMPLITUDE SHOCKS.
Semiannual rept. for 1 Feb-31 Jul 63,
by F. C. Gibson, R. W. Watson, J. E. Hay, C. R. Summers, and F. H. Scott. 11 Sep 63, 36p
ARPA Order44 63
BM-P 3898; N63 22372

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Detonations, Explosives initiators), (*Shock waves, Detonations), Containers, Acrylic resins, Steel, Aluminum, Liquids, Explosive materials, Cavitation, Charges (Explosive), Scientific research.

The report is a study of initiation and growth of detonation in explosives and propellants with principal emphasis placed on reactions resulting from low-amplitude shock waves. The specific area of interest is the initiation and propagation of detonations in explosives that are capable of both high and low velocity detonations. A description of the low-order reaction was sought in terms of the initial state of the explosive, the character of the initiating stimulus, and subsequent interactions that occur in the systems by virtue of its environment.

AD-418 698 Div. 22, 28
OTS Prices: HC $2.00/MF $0.50

Human Engineering Labs., Aberdeen Proving Ground, Md.
ABILITY OF SHOOTERS TO GAUGE TWO-ROUND BURSTS FROM THE AR15 RIFLE,
by James P. Torre, Jr. Jul 63, 30p
HEL TM9 63

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Human engineering, Firing tests (Ordnance), (*Firing tests (Ordnance), Human engineering), (*Automatic weapons, Firing tests (Ordnance)), Small arms, Ballistics, Ordnance.

This study examined the ability of ten shooters to fire automatic bursts of two rounds per trigger pull from the AR15 rifle under three different firing conditions. Under these firing conditions shooters can be expected to obtain a two-round burst per trigger pull approximately 75 percent of the time. (Author)

PB-166 127 Div. 22, 14, 17
OTS Prices: HC $3.00/MF $0.75

Springfield Armory, Mass.
BIBLIOGRAPHY OF SPRINGFIELD ARMORY REPORTS, TECHNICAL, MEMORANDUM, NOTES ON MATERIEL.
Bibliography for 1 Jan 48-30 Jun 59,
30 Sep 59, 63p
SA TR20 9100; AD 233 707

Unclassified report

Descriptors: (*Bibliographies, Materials), (*Materials, Ordnance), (*Ordnance, Reports), Guns, Abstracting, Tests, Metals, Performance (Engineering), Gun components, Test methods.

Presented is a bibliography of Springfield Armory reports - technical, memorandum, notes on materiel - prepared and distributed from 1 Jan 48 through 30 Jun 59. Technical abstracts are included for those technical reports issued after receipt of OCTI 200-4-57, 'Control and Distribution of Technical Reports,' 27 March 1957. (Author)

PB-166 250 Div. 22
OTS Prices: HC $1.00/MF $0.50

Naval Ordnance Test Station, China Lake, Calif.
THE EFFECTIVENESS OF CLUSTERED WARHEADS.
Technical Article 15,
by Eldon L. Dunn. Apr 62, 12p
NOTS TP2803

Unclassified report

Descriptors: (*Cluster warheads, Effectiveness), Warheads, Targets, Theory, Mathematical analysis, Scattering, Fragmentation ammunition.

The general problem of evaluating the effectiveness of clustered conventional weapons against likely limited-war targets is discussed. The influence of delivery error, warhead effectiveness, number of warheads per cluster, and bomblet dispersion on the effectiveness of a particular weapon is described. Analytical methods of determining the effectiveness of both individual and clustered warheads are given, and the methods are applied to pertinent examples. (Author)

AN INTRODUCTION TO PROGRAM EVALUATION REVIEW TECHNIQUE.
Jun 63, 52p
ESD TDR63 350

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Management control systems, Data processing systems), (*Management planning, Control sequences), Networks, Programming (Computers), Punched cards, Time, Probability, Scheduling, Input-output devices, Simulation.

A general introduction to PERT, an innovation in the field of management is presented. This technique employs a networking and statistical methodology using advanced data processing procedures. The PERT technique is based on the principle that planning must be developed in a manner that facilitates its use as a control tool and a control system must use its base the planning that governs the program. Accordingly PERT can be used in both the planning and control functions of management. (Author)

PB-166 242 Div. 26, 14, 17
OTS Prices: HC $1.00/MF $0.50

Ford Motor Co., Dearborn, Mich.
TITANIUM CARBIDE BASE CUTTING TOOLS, PART V.
Rept. no. 25, 1 Oct 58-31 Mar 59,
by Michael Humenik, Jr. and David Moskowitz.
31 Mar 59, 20p
Contract AF33 600 32448
AD 211 197

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Cutting tools, Carbides), (*Carbides, Cutting tools), (*Titanium compounds, Carbides), Cermets, Nickel, Molybdenum, Microstructure, Surface-active substances, Grain structure (Metallurgy), Life expectancy, Machining, Performance (Engineering), Wear resistance, Ceramic materials.

The microstructure of carbide base cermet materials has been found to be related to the wettability of the carbide phase. Additions of molybdenum to nickel-titanium carbide systems resulted in improved carbide wettability and refinement of the carbide grain size in sintered compacts. Standard machinability tests, employed to evaluate tool performance of Ni-Mo-TiC compositions, showed an approximate order of magnitude improvement in tool life over commercial tungsten carbide base cutting tools. Improved tool life of Ne-Mo-TiC over tungsten carbide grades was also obtained in production machining operations.

PB-166 243 Div. 26, 14, 17
OTS Prices: HC $1.00/MF $0.50

Ford Motor Co., Dearborn, Mich.
TITANIUM CARBIDE BASE CUTTING TOOLS, PART IV.
Rept. no. 21, 1 Apr-30 Sep 58,
by Michael Humenik, Jr. and David Moskowitz.
30 Sep 58, 14p
Contract AF33 600 32448
AD 204 861

Unclassified report

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Cutting tools, Carbides), (*Carbides, Cutting tools), (*Titanium compounds, Carbides), Ceramic materials, Cermets, Nickel, Molybdenum, Steel, Machining, Life expectancy, Performance (Engineering), Wear resistance, Sintering, Resistance (Electrical), Bonding, Controlled atmospheres, Hydrogen.

Results are reported for various steel semi-finish and finish production machining operations using Ni-Mo-TiC cutting tools. Comparative tool life-line data is also shown for titanium carbide base tools and commercial C-8 grades of cemented tungsten carbide. In addition, results of an investigation on the effect of sintering atmosphere and substrate on the electrical resistivity of Ni-Mo-TiC compositions are given.

PB-166 244 Div. 26, 14, 1.
OTS Prices: HC $1.00/MF $0.50

Ford Motor Co., Dearborn, Mich.
TITANIUM CARBIDE BASE CUTTING TOOLS, PART III.
Rept. no. 17, 1 Oct 57-31 Mar 58,
by Michael Humenik, Jr. and David Moskowitz. 31 Mar 58
13p
Contract AF33 600 32448
AD 162 314

Unclassified report

Descriptors: (*Cutting tools, Carbides), (*Carbides, Cutting tools), (*Titanium compounds, Carbides), Nickel, Molybdenum, Cermets, Machining, Life expectancy, Performance (Engineering), Fracture (Mechanics), Wear resistance, Ceramic materials.

Standard machinability tests have been continued on Ni-Mo-TIC compositions. In addition preliminary data is reported on tool life-line studies. Attempts to eliminate hair-line fractures observed in the tools during standard machinability tests have not been successful. Results are also reported for various tool tests on production machining operations. Tools on production machining operations were not subject to failure by fracture.

27. Propulsion Systems

No Entries

28. Psychology and Human Engineering

PB-166 345 Div. 28
OTS Prices: HC $1.00/MF $0.50

Minnesota Univ., Minneapolis.
FREQUENCY CHARACTERISTICS OF SUCCESSIVE WORD ASSOCIATION.
Technical rept. no. 12,
by Ephraim Rosen and Wallace A. Russell. Jul 56, 6p
Contract N8onr662 16
AD 102 964

Unclassified report

Rept. on The Role of Language in Behavior.
Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Word association, Verbal behavior), Reaction (Psychology), Culture, Psychometrics, Correlation techniques.

Legibility of this document is in part unsatisfactory. Reproduction has been made from best available copy.

Descriptors: (*Lasers, Organic materials), (*Organic materials, Lasers), (*Complex compounds, Lasers), Ketones, Europium compounds, Terbium compounds, Samarium compounds, Spectroscopy, Single crystals, Phosphorescent materials, Alcohols, Ethers, Acrylic resins, Epoxy plastics, Aluminum compounds, Electromagnetic waves.

The parameters pertinent to high power laser emission from organic materials were examined in relation to the Schawlow-Townes threshold condition. It is concluded that many Beta-diketone chelates of Eu3+, Tb3+ and Sm3+ are suitable laser materials, while the chelates of the other tripositive rare-earth ions are either borderline or unsuitable for laser applications. A list of the suitable chelates is presented and pertinent spectroscopic properties are given. It is also concluded that materials, which emit radiation via a fluorescent process, are generally unsuitable for laser applications, while only for the case of single crystals are phosphorescent materials applicable. Organic laser host materials found to be suitable were ethanol-methanol mixtures and EPA for a liquid laser, methylmethacrylate and epoxy resin for plastic hosts, and Al(AA)3 for a single crystal host. A series of rare-earth chelates were also laser tested at low temperatures in both liquid and solid solutions. (Author)

AD-425 685 Div. 25
OTS Prices: HC $3.00/MF $0.75

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE ELECTRIC FIELD GRADIENT TENSOR IN FERROUS COMPOUNDS.
Technical rept. no. 3,
by R. Ingalls. 22 Jul 63, 56p
Contract Nonr760 20, Proj. NR018 204
N64 12990

Unclassified report

Partly supported by the National Science Foundation.

Descriptors: (*Iron compounds, Electric fields), (*Crystal lattices, Iron compounds), (*Mossbauer effect, Iron compounds), Ammonium compounds, Chlorides, Fluorides, Oxalates, Silicates, Sulfates, Nuclear spins, Atomic orbitals, Tensor analysis, Polarization, Electric moments.

The electric field gradient tensor at the iron nucleus in ferrous (Fe2+) compounds was investigated. Under the combined action of axial and rhombic crystalline fields and the spin-orbit interaction, the ferrous ion (5D, 3d6) d-epsilon states produces a large, temperature dependent, contribution to the electric field gradient tensor. It was found that this direct contribution is diminished by that from the lattice itself (the second order axial and rhombic components of the crystalline field), as well as Sternheimer polarization effects and covalency. The results of this investigation were then applied to Mossbauer results in FeSiF6o6H2O to obtain an estimate of the electric quadrupole moment of Fe57m (0.29 ± 0.02b), which is in agreement with that from ferric (Fe3+) studies. Finally, estimates also based upon Mossbauer measurements, were made of the d-epsilon energy splittings in the ferrous compounds, FeSiF6H2O, FeSO47H2O, FeC2O42H2O, Fe(NH4SO4)6H2O, FeSO4, FeC12O4H2O and FeF2O. (Author)

AD-442 485 Div. 25
OTS Prices: HC $1.00/MF $0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON FREE OSCILLATIONS OF A CYLINDRICAL SHELL REINFORCED WITH STIFFENING RIBS,
by M. I. Karpov. 12 Jun 64, 8p
FTD TT64 72; TT 64 71196

Unclassified report

Unedited rough draft trans. of Akademiya Nauk URSR, Kiev. Dopovidi, 1963, no. 8, p. 1018-1021.

Descriptors: (*Stiffened cylinders, Oscillation), (*Oscillation, Stiffened cylinders), Cylindrical bodies, Structural shells, Reinforcing materials, Equations.

The problem of free oscillations of a reinforced shell, with consideration of discrete disposition of ribs on the shell, is connected with great mathematical difficulties. A method of solving the problem, formulated for accurately satisfying the equations of oscillations of a reinforced shell, is proposed. Frequency equations are obtained in form of a transcendental equation, which are more suitable for any kind of frequency spectrum investigation and for numerical calculations as well.

26. Production and Management

AD-405 201 Div. 26, 17
OTS Prices: HC $11.40/MF $3.50

Sheffield Corp., Dayton, Ohio.
MANUFACTURING METHODS FOR IMPOSED HIGH FREQUENCY VIBRATION SYSTEMS.
Final rept. for 2 Oct 59-15 Nov 62,
by Richard N. Roney and Dante Giardini.
Jan 63, 840p
Contract AF33 600 40122, Proj. 7 757
ASD TDR63 203

Unclassified report

Descriptors: (*Material removal, Vibration), (*Grinding wheels, Ultrasonic radiation), (*Ultrasonic radiation, Material removal), Steel, Titanium alloys, Aluminum alloys, Vanadium alloys, Stainless steel, Molybdenum alloys, Test methods, Tests, Temperature, Industrial equipment, Surface properties, Microstructure, Hardness, Heat-resistant metals and alloys, Instrumentation, Design, Data, Test equipment, Feasibility studies, Chromium alloys, Iron alloys, Tool steel, Cobalt alloys, Nickel alloys.

Vibrations from 60 cycles to 40,00 cycles per second were investigated for possible application to grinding. Direct vibration of the part being ground and vibration of the grinding wheel itself were used. Most successful in performance was the wheel vibrating in the 20,000 cycles per second frequency range. Benefits to conventional grinding are lower grinding temperature, lower power to grind, greater grinding ratios, no impairment to surface finish, no impairment to mechanical properties as to cracks, fatigue or tensile strength, even though using harder wheels than those normally used. An internal, external and surface grinder was modified to an ultrasonic grinder by attaching an ultrasonic spindle which vibrated the special ultrasonic wheel and hub assembly. Numerous grinding tests were made from which test criteria were established for the simulated production runs made on each of the three grinder types. Operational feasibility, adaptility to specific grinding operations, design variations and substantiation of previous findings were made. Procurement specifications, on industrial ultrasonic grinding machines, basically in the form of supplements to existing specifications, were made to include centerless as well as surface, external and internal grinders. (Author)

AD-410 452 Div. 26, 30
OTS Prices: HC $3.00/MF $0.50

Electronic Systems Div., Air Force Systems Command, Bedford, Mass.

31. Ships and Marine Equipment

No Entries

32. Miscellaneous Arts and Sciences

PB-166 331 Div. 32
OTS Prices: HC $6.00/MF $1.25

Research Analysis Corp., McLean, Va.
THE MAKE-UP AND PRODUCTION OF RUSSIAN NEWSPAPERS AND OTHER PRINTED MEDIA.
Technical memo.,
by Lessing A. Kahn, Robert L. Lasky, Robert Pierce, Peter K. Ogloblin, and Leo Teholiz.
Jun 53, declassified 2 Mar 54, 212p RAC-T-171
Contract DA44 188AR01
AD 16 397

Unclassified report

Rept. on Proj. POWOW. In cooperation with Bureau of Social Science Research, American Univ., Washington, D. C.
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Descriptors: (*Newspapers, USSR), (*USSR, Newspapers), Social sciences, Communism, Psychological warfare, Language, Vocabulary, Propaganda, Photographs, Design, Social Communication, Printing.

Since Communist Party leaders consider the press their most powerful weapon, experienced psychological warfare operators and language specialists of ORO studied Russian newspapers and other printed media (e.g., booklets, bulletin board announcements, posters, photographs, leaflets, seals and labels, tickets, and theater programs) with a view to providing a guide for production of this material when it is to be directed at a target audience in the USSR. All facets of make-up and format, such as size, design, typography, illustration, ornamentation, presswork, paper, and color are treated. Actual layouts are presented for all these media and specifications for publishing are given. (Author)

33. Transportation

No Entries

Using the technique of successive association, the second responses given by 63 subjects to 50 stimulus words from the Kent-Rosanoff word association test were analyzed with respect to their frequency characteristics. The major hypothesis was that the individual tends to respond in successive association with the same word sequence that composes the hierarchy of cultural frequencies obtained from previously gathered normative data. The results indicated that: (1) The second response in successive association has a cultural frequency lower than that of the first response. (2) The individual subject tends to produce a second response with a frequency lower than that of his own first response. (3) The most frequent second response in successive association tends to be the second most frequent response in the cultural norms, and the rank order of frequency of second responses correlates positively with the rank order of the cultural frequency of the same response words. It was concluded that the major hypothesis of the study was confirmed. The cultural frequency of an association may be viewed with some confidence as an index of the response strength of that association. (Author)

29. Quartermaster Equipment and Supplies

No Entries

30. Research and Research Equipment

AD-297 312 Div. 30, 8
OTS Prices: HC $3.00/MF $0.75

Mitre Corp., Bedford, Mass.
473L DPSS/ICSS INTERFACE DESCRIPTION,
by C. B. Brown. 4 Dec 62, 96p TM-3511
Proj. 473
ESD TDR63 160

Unclassified report

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Descriptors: (*Data processing systems, Systems engineering), (*Command and control systems, Data processing systems), Data transmission systems, Computers, Input-output devices, Control sequences, Computer logic, Wiring diagrams, Electronic equipment, Compatibility, Specifications.

This document contains material generated at meetings of the 473L Sub-system Integration Design Group (SIDG). Technical material presented herein does not constitute a specification but represents a generally concurred on description of the interface between the 473L Data Processor (AN/FYQ-11) and the System Integrated Consoles (AN/FYA-2, 3, and 4).

PB-181 568 Div. 30
OTS Prices: HC $1.25/MF $0.50

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS.
Nov 64

Unclassified report

Descriptors: (*Scientific research), (*Naval research), Neutrons, Pressure vessels, Atmosphere, Chemistry, Fuel oil, Aluminum, Magnesium, Glass textiles, Hydrocarbons, Towers (Chemistry), Carbon dioxide, Fire extinguishers, Mechanics, Shipborne, Motion, Metallurgy, Ceramic materials, Titanium alloys, Fatigue (Mechanics), Hydrogen, Palladium alloys, Heat transfer, Silver, Tin, Nuclear physics, Digital computers, Electron guns, Sky brightness, Water, Radio equipment, Antennas, Circuits, Very low frequency, Solid state physics, Glass, Sound, Ultrasonics, Power supplies, Patents.

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